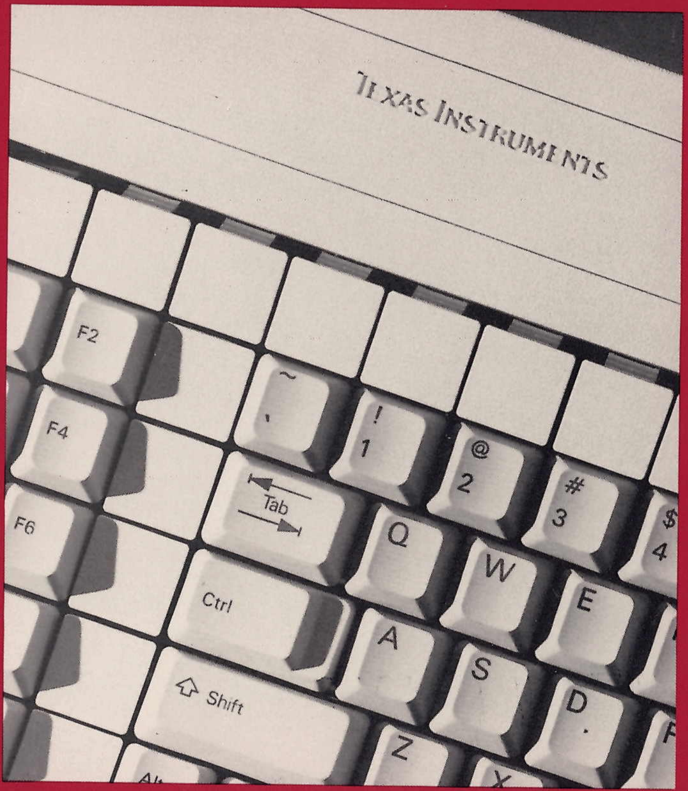
Texas Instruments

BUSINESS-PRO™ Professional Computer

Operating Instructions



Texas Instruments
BUSINESS-PRO™ Professional Computer
Operating Instructions
TI Part No. 2241058–0001
Original Issue: June 1985

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Consequently, TI cannot warrant that its systems are suitable for any specific customer application. The manager must rely on judgment of what is best for his or her business.

Record the serial number and purchase date in the spaces provided below. The serial number is on the label mounted on the bottom of the computer. All correspondence concerning your computer should include both the serial number and the date you purchased it.

Texas Instruments BUSINESS-PRO Professional Computer	______________ Serial Number	______________ Purchase Date

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Manual Update

Texas Instruments BUSINESS-PRO™ Professional Computer *Operating Instructions*, TI Part No. 2241058-0001

The Texas Instruments BUSINESS-PRO Professional Computer *Operating Instructions* manual is hereby updated with the latest available information.

About This Update

These Manual Update pages should be placed in the front of your manual. Be sure and remove page i from the manual and replace it with the page provided in this update.

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This document TI Part No. 2240814-0001

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This equipment manufactured by Texas Instruments for use in the United States conforms to the applicable FCC requirements.

Notice

This equipment generates and uses radio frequency energy, and if not installed and used properly, that is in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residental installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

1. Reorient the receiving antenna.
2. Relocate the computer with respect to the receiver.
3. Move the computer away from the receiver.
4. Plug the computer into a different outlet so that computer and receiver are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful:

''How to Identify and Resolve Radio-TV Interference Problems.''

This booklet is available from the U.S. Government Printing Office, Washington, DC 20402, Stock No. 004-000-00345-4.

This equipment has been certified to comply with the limits for a class B computing device, pursuant to Subpart J of Part 15 of the FCC Rules. Only peripherals (computer input/output devices, terminals, printers, etc.) certified to comply with the Class B limits may be attached to this computer. Operation with non-certified peripherals is likely to result in interference to radio and TV reception.

Shielded Cables

In order to ensure compliance with the Class B computing device radio frequency emission limitations, only shielded cables such as those specified by Texas Instruments should be utilized in connecting peripherals to this computer.

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Chapter 1: Documentation and Your System

An overview of the various types of documentation available for your system is provided in this chapter. This chapter also gives some suggestions on how to find information in this manual quickly by providing a quick-reference chart and by explaining the various devices used throughout the manual.

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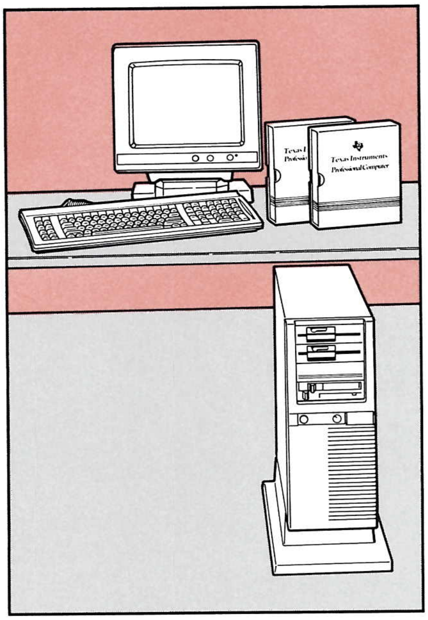
Learning to Use Your System

Your system consists of hardware, software, and documentation. Hardware is the physical equipment you use, such as the keyboard. Software is the set of instructions that tell the hardware what to do. Your documentation explains how to make the two work together.

Learning About Hardware

The main hardware components of your system are the system unit and the keyboard. You should also have a display unit, documentation, and may have some additional options.



Documentation

To learn about the hardware in your system, use the following documentation.

- Option manuals — provide characteristics, specifications and installation instructions for individual options
- *Installation Guide* — provides initial setup procedures, instructions for installing additional options, and instructions for removing an option
- This manual —provides general information about hardware and emphasizes in Chapters 3 and 4 the key components of the system (system unit, drives, floppy diskettes, and keyboard)

Making Hardware and Software Work Together

To use your hardware, you must have software. You select software according to your individual needs. Two major categories of software are:

- The operating system, which controls the basic operation of the system.
- An application program, which instructs the system to perform specific tasks by using either predesigned programs (such as a word processing program) or programming languages that allow you to design your own programs (such as BASIC).

Documentation

To learn how to make the hardware and software work together, you need to use the following documentation.

- Operating system manual — provides information about the operating system and how to make it work with your system. (Some operating system manuals also provide step-by-step examples to teach you how to use the operating system.)
- Application program manual — provides information about an application program and how to make it work with the operating system and your system. (Some application program packages also provide quick-reference aids, such as keyboard overlays and sample programs.)
- This manual — provides an overview of the interrelationships of all the parts of your system and explains what you need to do to make your application program and operating system work with your BUSINESS-PRO Computer.

Deciding What to Read

The two charts show the chapters recommended for different kinds of users. You may need more than one of the categories. For example, if you are a new user and have an international keyboard, read the chapters recommended for new users and for international users.

Chapter	Title	Users With No Computer Experience	Users With Some Computer Experience	Users With Extensive Computer Experience	International Users	Users of TI Mode	Users of PC-AT Mode
2	Preparing to Use Your System	●					
3	System Unit and Drives	●	●				
4	Keyboard	●	●			●	●
5	Software and Your System	●					
6	Common Software Operation	●					
7	Practical Considerations for Using Hardware and Software	●	●	●		●	●
8	Approaches to Problem Solving	●	●	●			
9	Problems Without Error Messages	●	●	●			
10	System Error Messages	●	●	●			
11	Maintenance	●	●	●			
12	Moving and Storing	●	●	●			

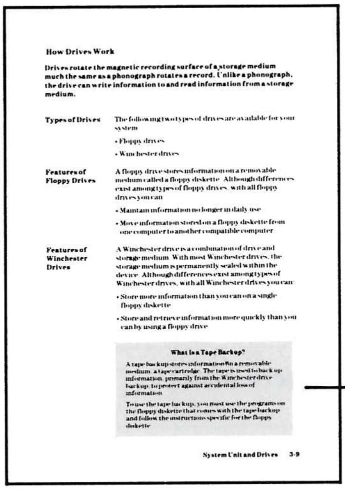
Appendix	Title	Users With No Computer Experience	Users With Some Computer Experience	Users With Extensive Computer Experience	International Users	Users of TI Mode	Users of PC-AT Mode
A	Effect of TI Mode on Keyboard					●	
B	Effect of PC-AT Mode on Keyboard						●
C	Control Codes, Characters, and the ALT Key			●			
D	Control Codes and the CTRL Key		●	●	●		
E	International Keyboards				●		
F	International Keyboards and the ALT Key				●		
G	International Keyboards and the ALT Key		●	●	●		
H	Operating Requirements	●	●	●			
I	Specifications			●			

Using Your Documentation

Several devices are used throughout this manual to help you find information quickly.

Dictionary Blocks

These shaded blocks provide quick access to additional information about key terms on the page. They are presented in the following way.



How Drives Work

Drives rotate the magnetic recording surface of a storage medium much the same as a phonograph rotates a record. Unlike a phonograph, the drive can write information to and read information from a storage medium.

Types of Drives The following two types of drives are available for your system:

- Floppy drives
- Winchester drives

Features of Floppy Drives A floppy drive stores information on a removable medium called a floppy diskette. Although differences exist among types of floppy drives, with all floppy drives you can:

- Maintain information no longer in daily use
- Move information stored on a floppy diskette from one computer to another compatible computer

Features of Winchester Drives A Winchester drive is a combination of drive and storage medium. With most Winchester drives, the storage medium is permanently sealed within the device. Although differences exist among types of Winchester drives, with all Winchester drives you can:

- Store more information than you can on a single floppy diskette
- Store and retrieve information more quickly than you can by using a floppy drive

What Is a Tape Backup?

A tape backup stores information on a removable medium, a tape cartridge. The tape is used to back up information, primarily from the Winchester drive backup, to protect against accidental loss of information.

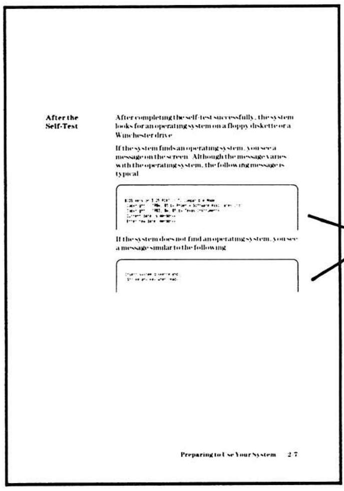
To use the tape backup, you must use the programs on the floppy diskette that comes with the tape backup and follow the instructions specific for the floppy diskette.

System Unit and Drives 3-9

dictionary block

Screens

Information that appears on the display unit is enclosed in the following way.



After the Self-Test After completing the self-test successfully, the system looks for an operating system on a floppy diskette or a Winchester drive.

If the system finds an operating system, you see a message on the screen. Although the message varies with the operating system, the following message is typical:

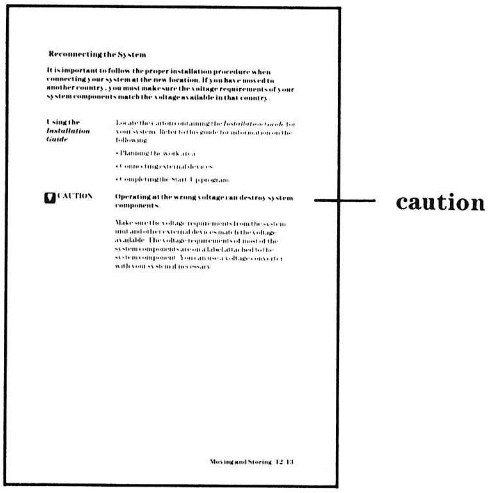
If the system does not find an operating system, you see a message similar to the following:

Preparing to Use Your System 2-7

screens

CAUTIONS

Your system is designed for safety. Just as with other types of electrical equipment, however, certain cautions should be followed in using your equipment. All cautions are presented in the following way.



Reconnecting the System

It is important to follow the proper installation procedure when connecting your system at the new location. If you have moved to another country, you must make sure the voltage requirements of your system components match the voltage available in that country.

Using the *Installation Guide*

Locate the carton containing the *Installation Guide* for your system. Refer to this guide for information on the following:

- Planning the work area
- Connecting external devices
- Completing the Start Up program

CAUTION

Operating at the wrong voltage can destroy system components.

Make sure the voltage requirements from the system unit and other external devices match the voltage available. The voltage requirements of most of the system components are on a label attached to the system component. You can use a voltage converter with your system if necessary.

Moving and Storing 12-13

Chapter 2: Preparing to Use Your System

Some general principles and procedures for the safe operation of your system are explained in this chapter. Information on how to adjust the BUSINESS-PRO Computer for your personal comfort and convenience is also provided.

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Protecting the System

The BUSINESS-PRO Computer is no more fragile than a stereo system or television. By following some standard practices, you can help protect your system from accidents that could damage it.

Environmental Considerations

If you planned your work area according to the recommendations in the *Installation Guide*, you should have few problems because of your working environment. Some common office practices, however, can seriously damage your system or floppy diskettes and should be avoided.

Recommended Practices

The following practices can help prevent damage to your system or floppy diskettes.

- Keep liquids, such as coffee and soft drinks, away from the work area. Floppy diskettes and your system can be ruined if they become wet.
- Avoid smoking near the system. Ashes and smoke residue can damage floppy diskettes, floppy drives, and tape backups.
- Keep food away from the system.

Electrical and Power Considerations

Your system needs a constant power supply to work reliably. Two special power supply problems are listed below.

- Power surges — sudden increases of power on the line, often caused by having other equipment, such as copiers and air conditioners, on the same circuit as the system
- Power losses — sudden interruptions of power caused by a storm or an equipment failure at the power company

Recommended Practices

The following practices can help prevent damage and problems while using the system.

- Always turn off external devices connected to the system unit before turning off the system unit.
- Turn off the system during severe electrical storms.
- Protect the power supply to your system by plugging it into a line separate from other equipment or by using a power-line conditioner that reduces the effect of power surges.

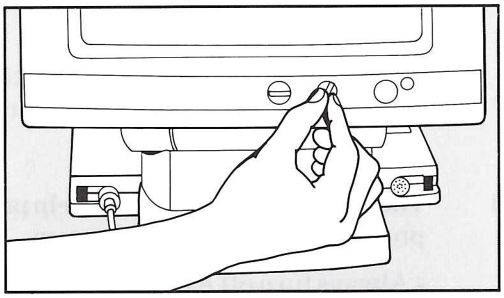
Adjusting the System

Three system components can be positioned to make them more comfortable and easier to use. You can adjust the display unit, the keyboard, and the mouse.

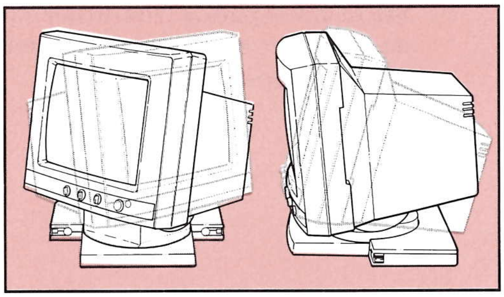
Display Unit

On a BUSINESS-PRO display unit, you can adjust the controls, as well as the angle and tilt of the screen.

You can adjust the volume and brightness on both the color and monochrome display units. On monochrome display units, you can also adjust the contrast.



Adjusting the angle and tilt of color and monochrome display units reduces glare from lights and gives you a better view of the screen.



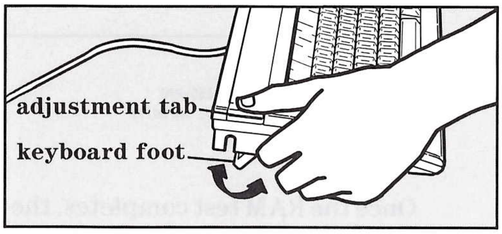
Mouse

You can plug an optional mouse into either keyboard connector on a BUSINESS-PRO display unit, depending on whether you are right-handed or left-handed.

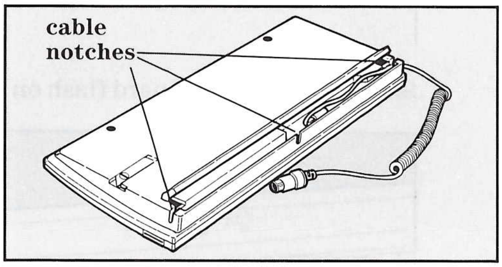
Keyboard

The keyboard for your system has several design features that make the keyboard easily adjustable.

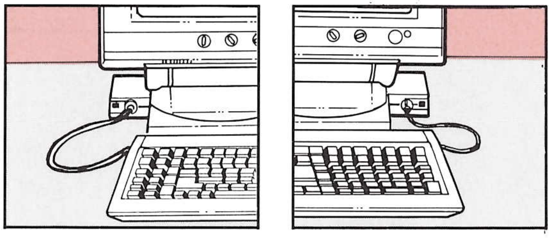
You can change the angle of the keyboard by adjusting the keyboard foot.



You can route the keyboard cable through three different cable notches.



You can plug the keyboard into either keyboard connector on a BUSINESS-PRO display unit.



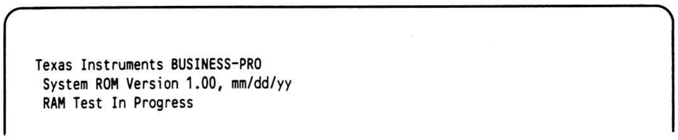
Before Turning On the System

Before you turn on the system, you should familiarize yourself with the system self-test, which occurs each time you turn on the system. The procedure below assumes the Start-Up program on the Diagnostics diskette has been run. After the self-test completes successfully, the system looks for an operating system.

The System Self-Test

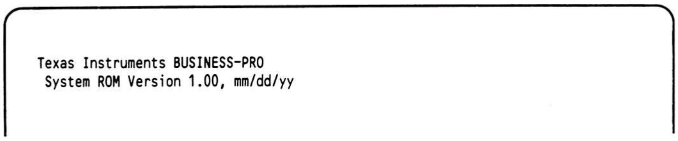
The system self-test checks the basic parts of the system, such as memory and the keyboard. The steps of the self-test, which are listed below, occur almost simultaneously.

This screen appears.



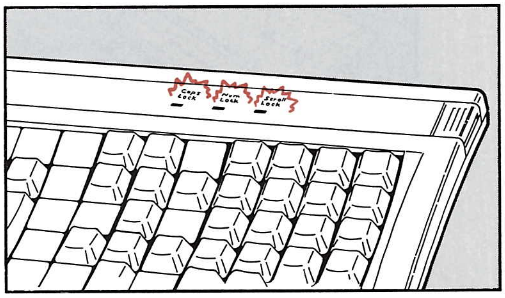
```
Texas Instruments BUSINESS-PRO
 System ROM Version 1.00, mm/dd/yy
 RAM Test In Progress
```

Once the RAM test completes, the screen looks like this.



```
Texas Instruments BUSINESS-PRO
 System ROM Version 1.00, mm/dd/yy
```

Status lights on keyboard flash on and off.



After the Self-Test

After completing the self-test successfully, the system looks for an operating system on a floppy diskette or a Winchester drive.

If the system finds an operating system, you see a message on the screen. Although the message varies with the operating system, the following message is typical.

```
BIOS Version 3.05 TI Compatible Mode
 Copyright © 1984, 85 by Phoenix Software Associates Ltd.
 Copyright © 1983, 84, 85 by Texas Instruments
 Current date is mm-dd-yy
 Enter new date (mm-dd-yy):
```

If the system does not find an operating system, you see a message similar to the following.

```
Error attempting to boot system
 Insert system disk

Press the space bar to continue
```

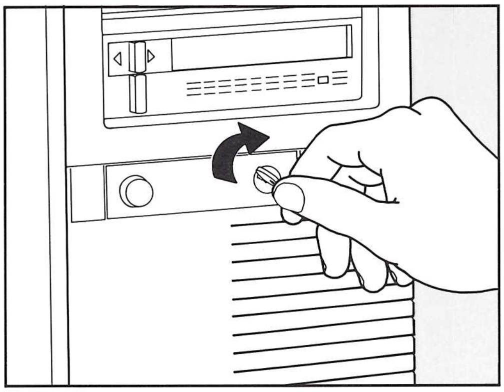
Turning On the System

The following procedure explains how to turn on the system and verify the self-test has completed correctly. (If you do not know what the system does when you turn it on, refer to the previous page.) Do not insert any floppy diskettes at this time. The correct procedure for inserting floppy diskettes is explained on page 3-15 of this manual.

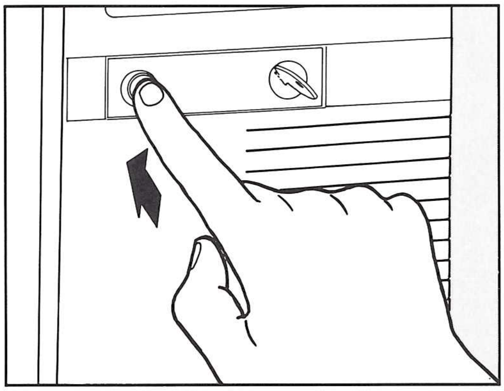
Procedure

To turn on the system, follow these steps.

1. Turn on all external devices, such as the display unit and the printer.
2. Turn the key in the security lock to the unlocked position.

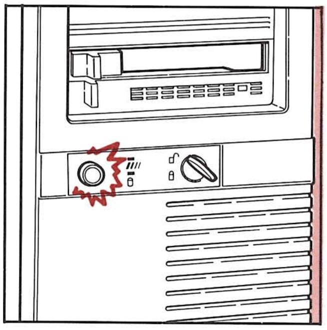


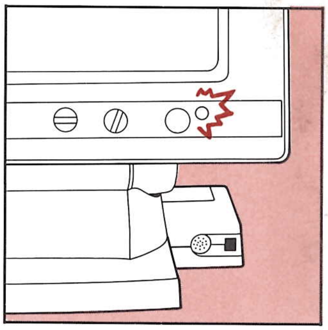
3. Turn on the system unit by pressing the **ON/OFF** button.



Procedure (Continued)

4. Verify that the power indicators for the system unit and display unit come on.



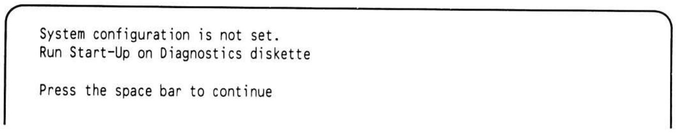


5. Verify that the self-test has completed successfully by checking for one of the following screens.
   - A screen indicating the system has found an operating system
   - A screen indicating you need to insert a floppy diskette containing an operating system

If You Have Problems

If the self-test did not complete successfully, your system may have a problem. Refer to pages 8-2 and 8-3 in this manual to decide what to do.

If the following message appears on the screen, you need to run the Start-Up program on the Diagnostics diskette. Refer to the *Diagnostics User's Guide* for instructions on how to run the Start-Up program.



```
System configuration is not set.
Run Start-Up on Diagnostics diskette

Press the space bar to continue
```

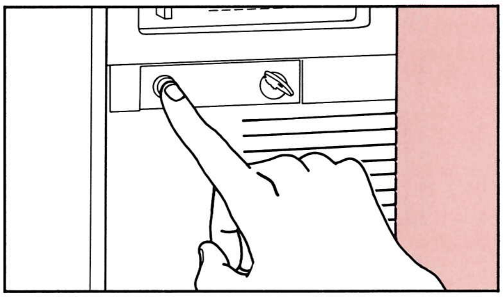
Turning Off the System

When you are ready to turn off your system, following the correct procedure can help protect your system components. Turn off the system when you do not intend to use it for an extended period of time. You do not need to turn off the system if you are leaving it for only a short time.

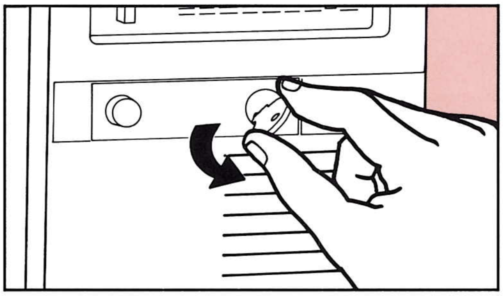
Procedure

To turn off the system, follow these steps.

1. Turn off all external devices.
2. Turn off the system unit by pressing the **ON/OFF** button.



3. To prevent unauthorized use of your system, turn the key in the security lock to the locked position and remove the key.



Chapter 3: System Unit and Drives

Information about the system unit and the role it plays in your system is described in this chapter. It also describes the types of drives available for your system unit.

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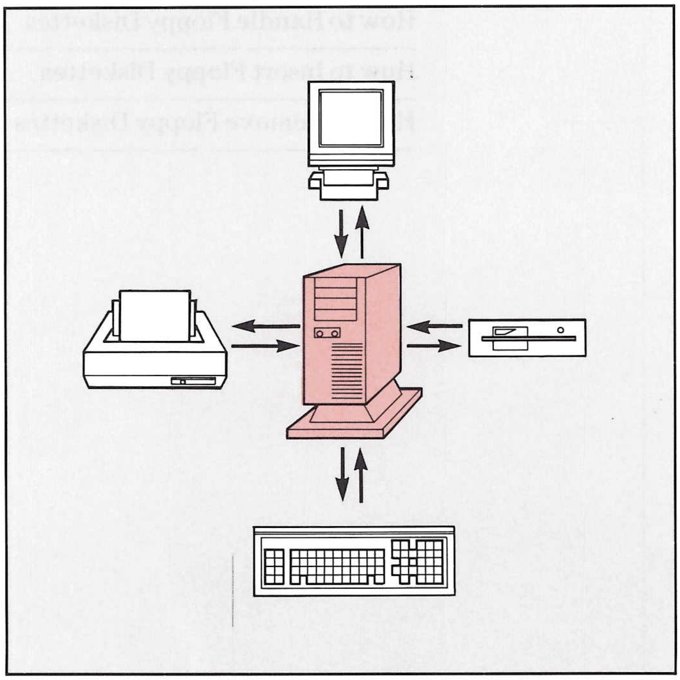
The System Unit and Your System

The central component of your system is the system unit. It contains the central processing unit (CPU) and internal memory. It also houses drives and option boards and connects to external devices.

Role of the System Unit

The system unit has four functions.

- To provide power to the drives, option boards, and three external devices — the display unit, the keyboard, and the mouse
- To receive information from other components of the system, such as the keyboard and the drives
- To process information using the CPU and internal memory
- To send the processed information to other components of the system, such as the display unit and the printer



How the System Unit Works

The CPU processes information and stores it in internal memory in the system unit. Processing information includes the calculating, sorting, storing,and retrieving of information.

Internal Memory and Processing

Your system unit contains three types of internal memory — ROM (Read-Only Memory), RAM (Random-Access Memory), and a battery-supported RAM.

ROM contains information that is built into the system unit, such as the self-test. The contents of ROM are permanent and remain in the system unit even when it is turned off.

RAM contains information that you place in it, such as programs and information on which you are working. The contents of RAM are temporary and disappear when the system unit is turned off. If you want to keep this information, you must use a drive to store it on media.

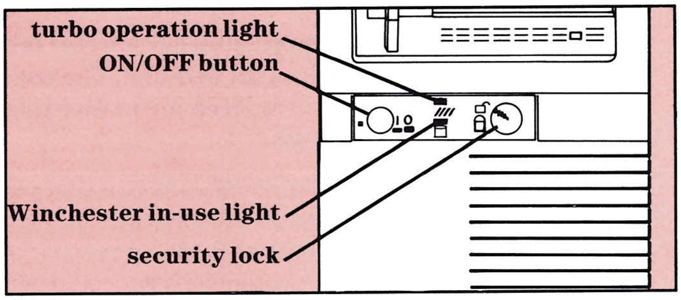
The battery-supported RAM (sometimes called CMOS RAM) contains essential information about your system, such as the information you enter in the Start-Up program. Unlike the other kind of RAM, the contents remain even when the system unit is turned off.

Parts of the System Unit

The front and back views of your system unit may differ slightly from the illustrations shown if you have any optional equipment installed.

Front View

The following illustration shows the front of the system unit.



Part	Definition
Turbo operation light	Lights when turbo operation is active
ON/OFF button	Turns the system on or off; lights when the system is on
Winchester in-use light	Lights when a Winchester drive is active
Security lock	Restricts access to the system; when locked, prevents the front panel from being removed

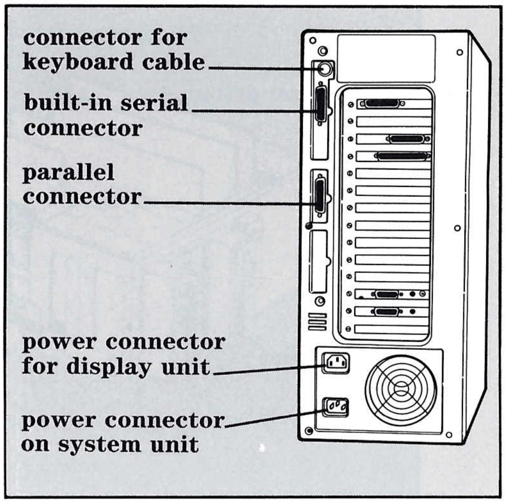
What Is Turbo Operation?

Turbo operation, which requires an operating system that supports it, can increase the speed of your system. Software that contains timing loops (part of the program that must complete in a specific amount of time) does not work in turbo operation.

To determine if a program can function using turbo operation, switch to turbo operation using the operating system command. If the program fails, only run the program in regular operation.

Back View

The following illustration shows the back of the system unit.

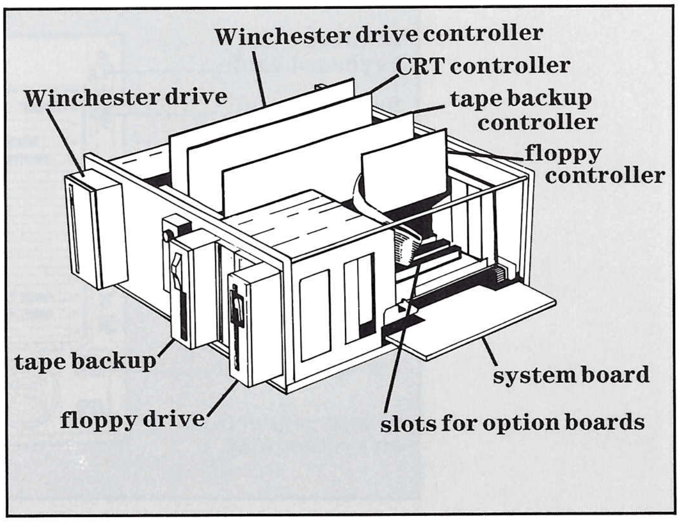

connector for keyboard cable
built-in serial connector
parallel connector
power connector for display unit
power connector on system unit

Part	Definition
Connector for keyboard cable	Where you connect either the keyboard cable or the display unit data cable to the system unit
Built-in serial connector	Where you connect a serial device, such as a serial printer, a modem, or a mouse
Parallel connector	Where you connect a parallel printer
Power connector for display unit	Where you connect the power cable for the display unit
Power connector on system unit	Where you connect the power cable from the power outlet

The inside of the system unit, just like the outside of the system unit, varies with the options you have installed.

Internal View

The following illustration shows a view of the inside of the system unit.



Internal View (Continued)

Part	Definition
CRT controller	Controls how information is sent from the system unit to the display unit
Floppy drive	Stores information on floppy diskettes
Floppy controller	Controls how information is transferred between the system unit and floppy drives
Slots for option boards	Hold up to 14 option boards
System board	Contains the CPU and most of the internal memory
Tape backup	Stores information on tape backup cartridges
Tape backup controller	Controls how information is transferred between the system unit and the tape backup
Winchester drive	Stores information on platters, which are sealed in the Winchester drive
Winchester drive controller	Controls how information is transferred between the system unit and Winchester drives

Drives and Your System

Drives are controlled by the system unit and are generally installed within it. Since the amount of information you can store in internal memory is limited, drives allow you to work with more information than when using internal memory alone. They also allow you to store software and preserve work that you have done.

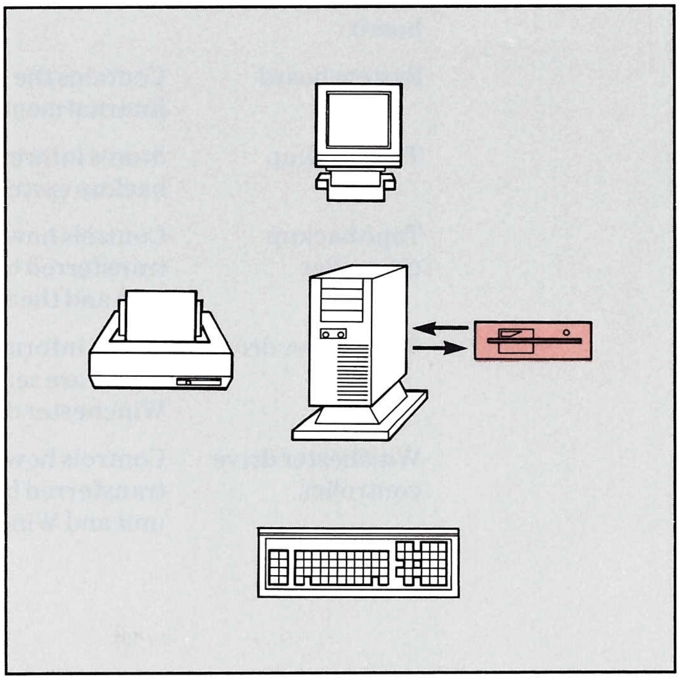
Role of Drives

Drives have two functions.

- To write to storage media
- To read from storage media

Writing is the process of transferring information from the internal memory of the system unit to floppy diskettes, Winchester drives, and other storage media.

Reading is the process of retrieving information that has been stored on storage media and transferring it to internal memory.



Drives rotate the magnetic recording surface of a storage medium much the same as a phonograph rotates a record. Unlike a phonograph, the drive can write information to and read information from a storage medium.

Types of Drives

The following two types of drives are available for your system.

- Floppy drives
- Winchester drives

Features of Floppy Drives

A floppy drive stores information on a removable medium called a floppy diskette. Although differences exist among types of floppy drives, with all floppy drives you can:

- Maintain information no longer in daily use.
- Move information stored on a floppy diskette from one computer to another compatible computer.

Features of Winchester Drives

A Winchester drive is a combination of drive and storage medium. With most Winchester drives, the storage medium is permanently sealed within the device. Although differences exist among types of Winchester drives, with all Winchester drives you can:

- Store more information than you can on a single floppy diskette.
- Store and retrieve information more quickly than you can by using a floppy drive.

Winchester Drives and Tape Backups

A tape backup stores information on a removable medium, a tape cartridge. The tape is used to back up information, primarily from the Winchester drive backup, to protect against accidental loss of information.

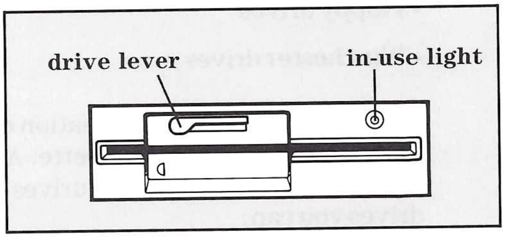
To use the tape backup, you must use the programs on the floppy diskette that comes with the tape backup and follow the instructions specific for the floppy diskette.

Parts of Drives

Although different kinds of floppy drives and Winchester drives are available, each kind has the same basic parts.

Floppy Drives

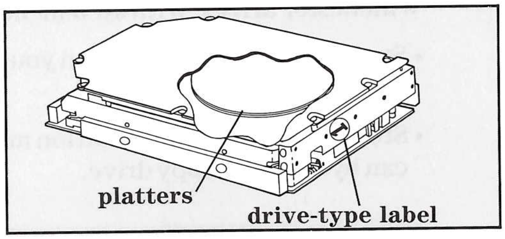
The following illustration shows the basic parts of a floppy drive.



Part	Definition
Drive lever	Opens and closes the floppy drive
In-use light	Lights when the floppy drive is selected

Winchester Drives

The following illustration shows an internal view of the Winchester drive.



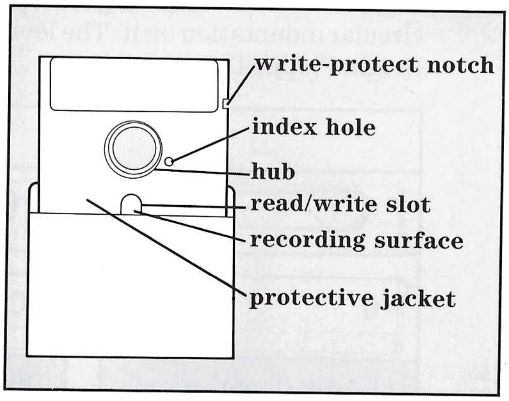
Part	Definition
Drive-type label	Identifies the type Winchester drive you have; you must include this information in the Start-Up program
Platters	Contain stored information

Parts of Floppy Diskettes

Although different kinds of floppy diskettes are available with various storage capacities, the basic parts of a floppy diskette are the same.

Floppy Diskette

The following illustration shows the basic parts of a floppy diskette.



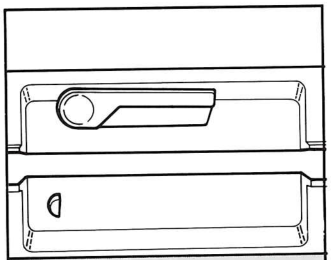
Part	Definition
Write-protect notch	When covered with a write-protect tab, prevents a floppy drive from writing to the floppy diskette
Index hole	Helps the floppy drive find information on a floppy diskette
Hub	Reinforces the area of the recording surface that the floppy drive touches to rotate the floppy diskette
Read/write slot	Gives the floppy drive access to the recording surface to read or write information
Recording surface	Used for the storage of information
Protective jacket	Permanently encases the recording surface and enables you to handle the floppy diskette without damaging the surface

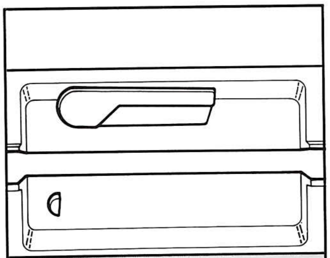
How to Select the Correct Floppy Diskette for Your Floppy Drive

Two types of floppy drives available for your system are the 360 Kb Half-Height Floppy Drive and the 1.2 Mb Half-Height Floppy Drive. (The abbreviations Kb and Mb refer to kilobyte and megabyte, respectively.) Each type of floppy drive uses a different type of floppy diskette.

Identifying Your Floppy-Drive Type

The drive lever on the BUSINESS-PRO floppy drive indicates which type of floppy drive you have. The lever on a 1.2 Mb Half-Height Floppy Drive has a circular indentation on it. The lever on a 360 Kb Half-Height Floppy Drive is plain.


1.2 Mb floppy drive


360 Kb floppy drive

Purchasing Floppy Diskettes

You should purchase floppy diskettes that give you maximum reliability and service and that are designed to work with your particular type of floppy drive.

- When you buy floppy diskettes for a 1.2 Mb Half-Height Floppy Drive, make sure they have reinforced hubs and that these terms appear on the package: high capacity or high density, 5-1/4 inch, double-sided, and soft sectored.
- When you buy floppy diskettes for a 360 Kb Half-Height Floppy Drive, make sure they have reinforced hubs and that these terms appear on the package: double density, 5-1/4 inch, double-sided, and soft sectored.

Compatibility of Floppy Diskette With Floppy Drives

Using a floppy diskette in the wrong floppy drive could result in a loss of information from your floppy diskette. Two rules to follow in using floppy diskettes are:

- A 1.2 Mb floppy diskette works in 1.2 Mb floppy drives only.
- A 360 Kb floppy diskette works in both 360 Kb floppy drives and 1.2 Mb floppy drives, with one exception. Once you write information to a 360 Kb floppy diskette using a 1.2 Mb floppy drive, you can use that floppy diskette only in a 1.2 Mb floppy drive.

The following chart summarizes how you can use these floppy diskettes.

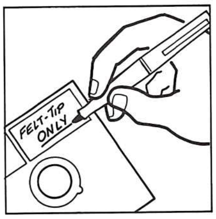
	If You Are Using a 360 Kb Floppy Drive	**If You Are Using a 1.2 Mb Floppy Drive**
Read From a 360 Kb Floppy Diskette	Yes (If you have not written to the floppy diskette using a 1.2 Mb floppy drive)	Yes
Write to a 360 Kb Floppy Diskette	Yes	Yes (If you do, you must use the floppy diskette only in 1.2 Mb drives)
Read From a 1.2 Mb Floppy diskette	No	Yes
Write to a 1.2 Mb Floppy Diskette	No	Yes

How to Handle Floppy Diskettes

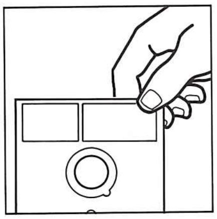
To avoid damaging your floppy diskettes, you need to keep in mind a few guidelines when handling them.

Recommended Practices

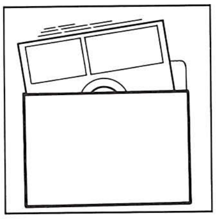
Follow these practices when handling floppy diskettes.



Use felt-tip pin



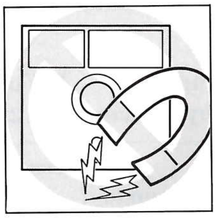
Handle by corners



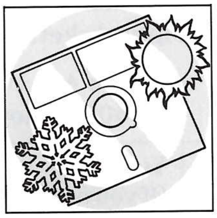
Store in jacket

Practices to Avoid

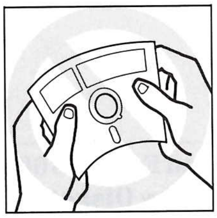
Avoid these practices when handling floppy diskettes.



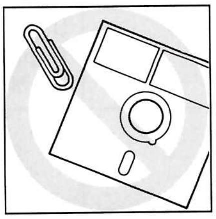
Avoid magnets



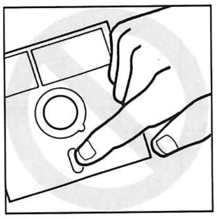
Avoid extreme temperatures



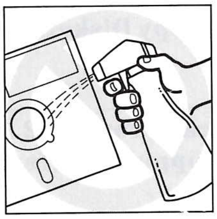
Avoid bending



Do not attach paper clips



Do not touch the recording surface



Do not clean with fluids

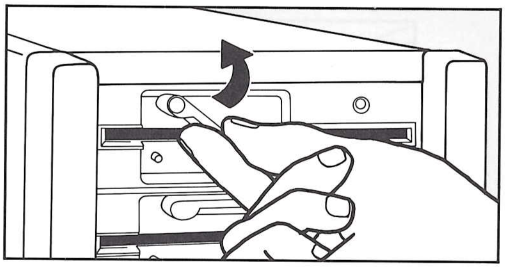
How to Insert Floppy Diskettes

Regardless of the type of floppy drive you have, you always insert a floppy diskette using the procedure below. To prevent possible damage when inserting floppy diskettes, ensure your system unit is on and the in-use light is off.

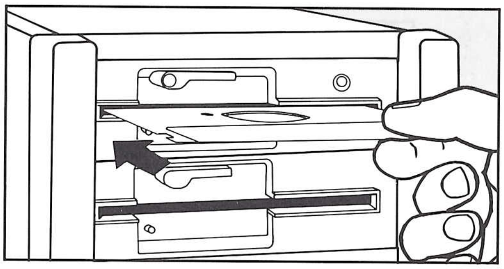
Procedure

Follow these steps when inserting a floppy diskette into a floppy drive.

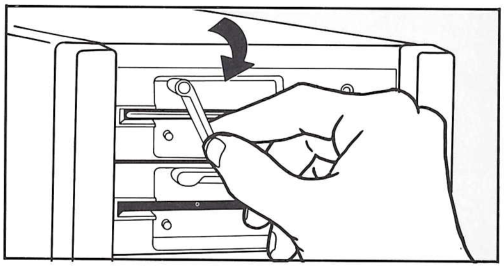
1. Move the drive lever up to open the floppy drive.



2. Insert the floppy diskette with the label side up and the write-protect notch to the left.



3. Move the drive lever down to close the floppy drive.



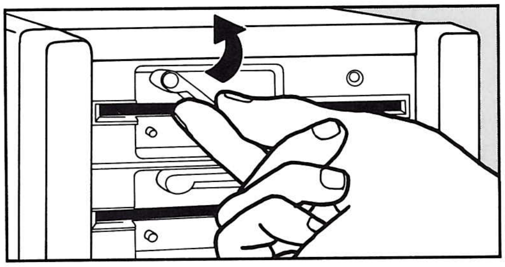
How to Remove Floppy Diskettes

To prevent possible damage when you remove floppy diskettes, ensure your system unit is on.

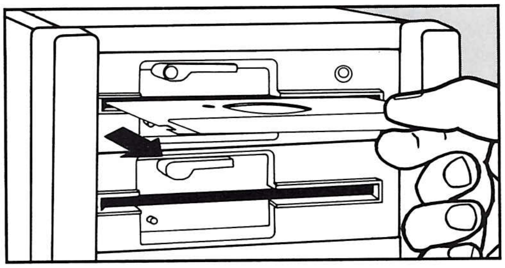
Procedure

Follow these steps when removing a floppy diskette from a floppy drive.

1. Make sure the in-use light on the floppy drive is off.
2. Move the drive lever up to open the floppy drive.



3. Remove the floppy diskette and store it in the protective jacket.



Chapter 4: Keyboard

Information about the keyboard and the different types of keys on the keyboard is described in this chapter.

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Parts of the Keyboard 4-4

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Types of Keys on Your Keyboard 4-6

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Typewriter-Like Keys 4-9

Cursor-Control Keys 4-10

CTRL and ALT Keys 4-11

Function Keys 4-12

Keys on the Numeric Keypad 4-14

The Keyboard and Your System

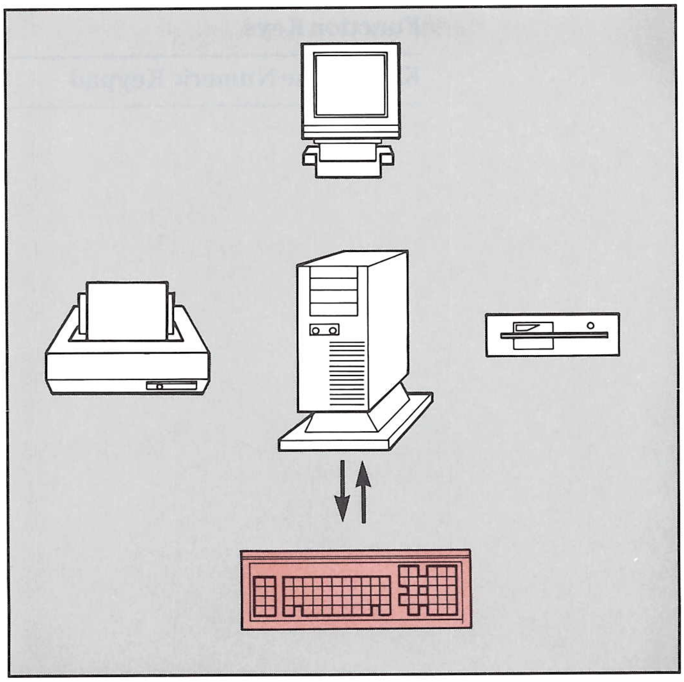
The keyboard is your primary means of giving information to the system.

Role of the Keyboard

When you press a key, the keyboard sends a signal to the system unit. Each key on the keyboard has a unique signal. The system unit interprets the signals from the keyboard as long as the security lock on the system unit is in the unlocked position.

The system unit can interpret a signal in one of two ways.

- As a character, which the system unit displays on the screen
- As a command, which causes the system unit to perform a specific task, such as inserting a character in text



How Keyboard Signals Are Interpreted

Three different things affect the way the system unit interprets the signals from the keyboard — the software you are using, the mode you are using, and the version of the keyboard you are using.

Software and the Keyboard

Software, both operating systems and application programs, can interpret any signal from the keyboard as a command. With some application programs, for example, you press the letter Q to quit using the program.

For details on how keyboard signals are interpreted by the software you are using, refer to your software manual.

Mode and the Keyboard

To use either TI or PC-AT mode, you need the correct CRT controller, an operating system that supports the mode, and an application program that runs in the mode. The mode you select then affects how signals from the keyboard are interpreted.

- If you are using TI mode, the keyboard operates like a keyboard for the Texas Instruments Professional Computer (TIPC). Refer to Appendix A for more information about the effect of TI mode on the keyboard.
- If you are using PC-AT mode, the keyboard operates like a keyboard for the PC AT. Refer to Appendix B for more information about the effect of PC-AT mode on the keyboard.

International Keyboards

The BUSINESS-PRO Computer has different international versions of the keyboard. Each version has different keys that meet the requirements of a specific language. Although an international keyboard looks different from the U.S. keyboard, all keyboards send the same signals. For the system unit to interpret signals from an international keyboard correctly, you must use an operating system command to select the correct keyboard version.

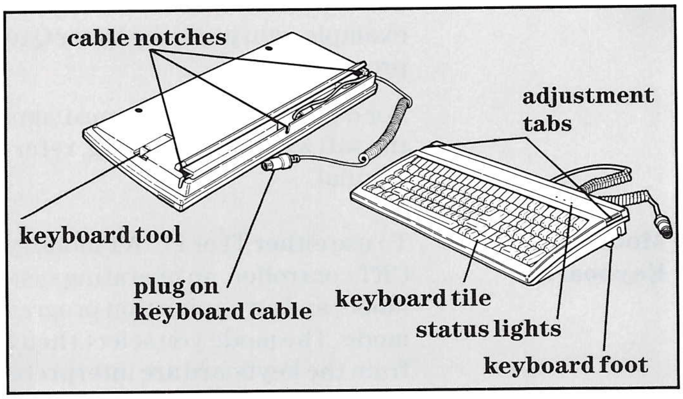
For more information on international keyboards, refer to Appendixes E and F.

Parts of the Keyboard

Whether you have a U.S. or an international keyboard, the parts shown in the illustration are the same for all keyboards.

The Standard Keyboard

The following illustration shows the parts of the keyboard.



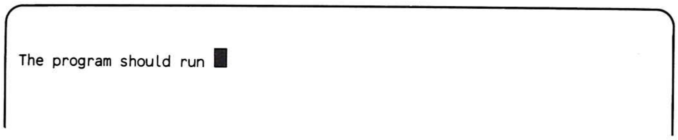
Part	Definition
Cable notches	Allow you to put the keyboard cable in three different positions
Adjustment tabs	Allow you to raise or lower the keyboard foot
Keyboard tool	Allows you to remove keyboard tiles and keys from the keyboard; located on the bottom of the keyboard
Plug on keyboard cable	Connects to the connector for the keyboard cable on either a TI display unit or the back of the system unit
Keyboard tile	Covers a place on the keyboard where additional keys can be added
Status lights	Light when the corresponding keyboard operation is active
Keyboard foot	Controls the angle of the keyboard

Using Your Computer Keyboard

Although your computer keyboard resembles a typewriter keyboard, the computer keyboard does not operate the same way. Four of the special features of your system that make your keyboard different from a typewriter keyboard are: the cursor, the repeat-action keys, the security lock on the system unit, and the keyclick feature.

Cursor and Displayable Characters

Pressing some of the keys on the keyboard causes the system unit to display characters on the screen. The small square that shows where the next character will appear is called a cursor.



```
The program should run █
```

Repeat-Action Keys

All keys are repeat-action keys. Holding down a repeat-action key causes the keyboard to send repeated signals. This is true of keys for characters and commands.

- When you press and hold down a key for a displayable character, such as the letter b, the character repeats on the screen until you release the key.
- When you press and hold down a key for a command, such as the **BACK SPACE** key, the command repeats until you release the key.

Keystrokes are stored in a type-ahead buffer in your keyboard, so do not continue to press the same key if the corresponding character does not appear immediately on the screen.

Although all keys on the keyboard are repeat-action keys, for some keys the system unit ignores repeated signals. These keys are the **CTRL** key, the **ALT** key, the **SHIFT** key, the **CAPS LOCK** key, and the **NUM LOCK** key.

Security Lock

To use the keyboard, the security lock must be in the unlocked position. Because locking the security lock disables the keyboard, you can prevent unauthorized use of your system without turning off the system unit.

Keyclick

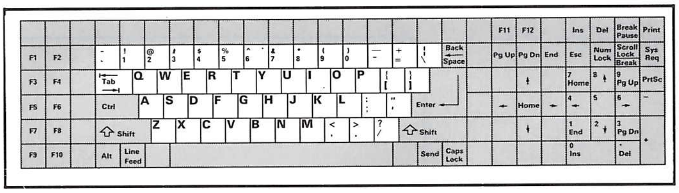
The keyboard clicks each time you press a key. You can adjust the volume of the click through software.

Types of Keys on Your Keyboard

Your computer keyboard has six main groups of keys that either produce characters or give commands to control your system. Your keyboard could look different if the place of purchase modified it. In this case, refer to information you received from the place of purchase for the types of keys on your keyboard.

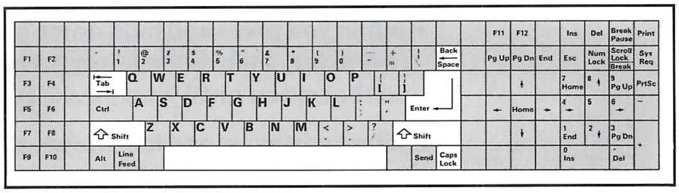
Letter, Number, and Symbol Keys

Pressing one of these keys produces a character on the screen, just as pressing the same key on a typewriter prints a character on paper.



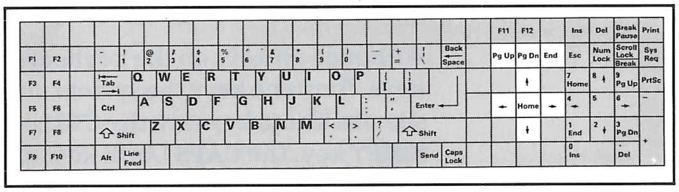
Typewriter-Like Keys

These keys have names similar to some keys on a typewriter; however, they function differently from keys on a typewriter.



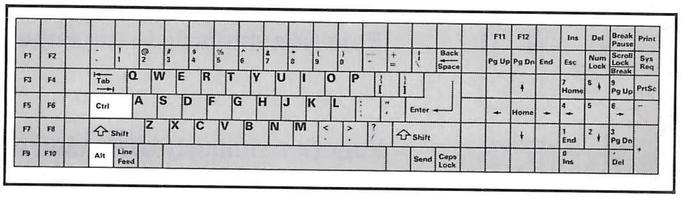
Cursor-Control Keys

These keys move the cursor to a new position on the screen. Moving the cursor with one of these keys usually does not affect characters shown on the screen.



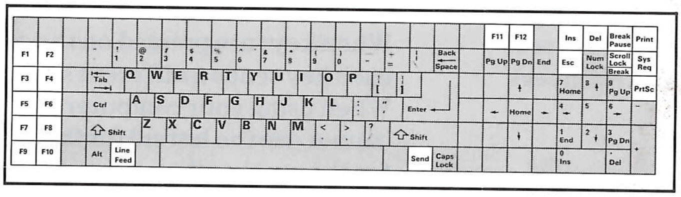
CTRL and ALT Keys

Although the keyboard of your system contains only 100 keys, your system can produce 256 different characters by using the **CTRL** key or the **ALT** key in conjunction with other keys.



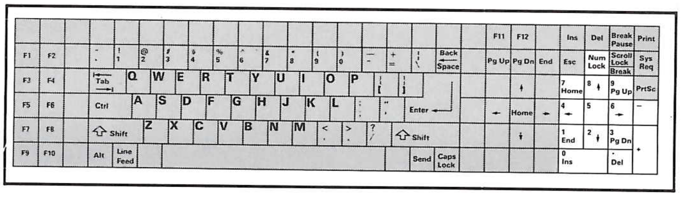
Function Keys

These keys control different operations of the system and usually do not display characters on the screen. The way these keys work depends mainly on the software and the mode you are using.

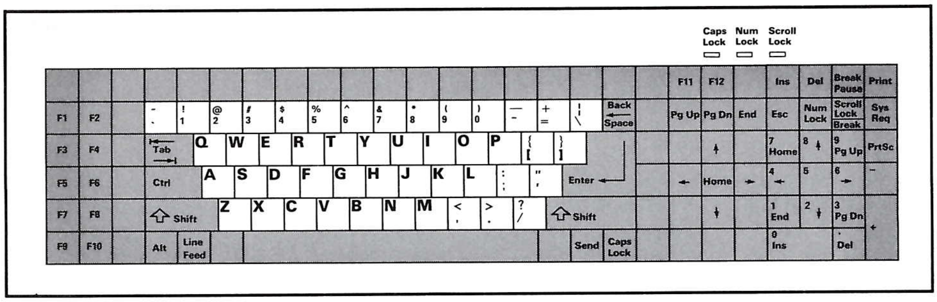


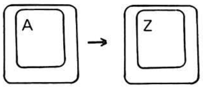
Keys on the Numeric Keypad

Although these keys are duplicated elsewhere on your keyboard, the numeric keypad makes it easier to type long series of numbers and to give some commands to control your system.

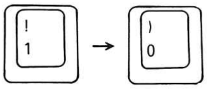


Letter, Number, and Symbol Keys

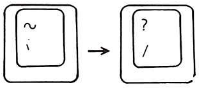




Function similarly to the same keys on a typewriter



Function similarly to number and symbol keys on a typewriter

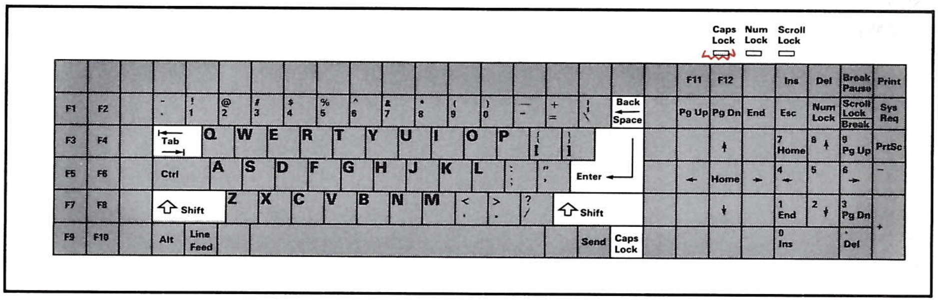


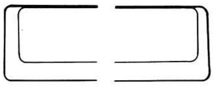
Function similarly to symbol keys on a typewriter; however, more symbol keys are available, and they may be in different positions

Using Letters and Numbers

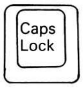
When keys are pressed on the computer keyboard, each key sends a different signal to the system unit. When using your computer keyboard, therefore, you cannot use the letter l for the number 1 or the letter O for the number 0.

Typewriter-Like Keys

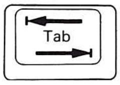




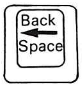
Creates a space; replaces existing characters with a space



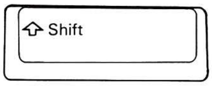
Capitalizes all letters; when used with a key with two symbols or functions, such as a number key, produces the lower symbol or function on the keycap (The **CAPS LOCK** light comes on when the key is active.)



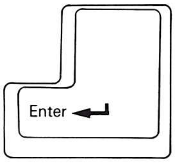
Moves cursor to the right a predetermined number of spaces; the number of spaces depends on software; when shifted, moves cursor to the left a predetermined number of spaces; may operate differently depending on software



Used to backspace; moves cursor one space to the left and erases any character in that space



Capitalizes all letters; when used with a key with two symbols or functions, produces the upper symbol or function on the keycap

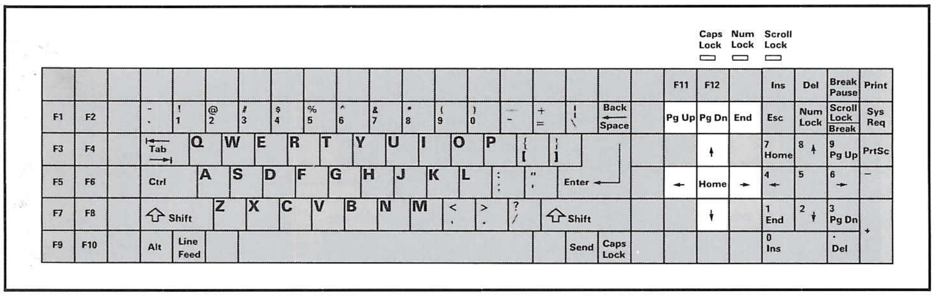


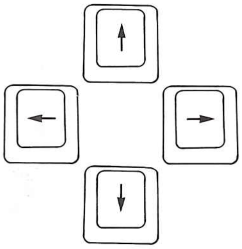
Causes the system either to accept a line of text or execute a command you have typed and then moves the cursor to the beginning of a new line

Using the SHIFT Key With the CAPS LOCK Key

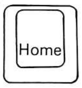
In PC-AT mode, pressing the **SHIFT** key while the **CAPS LOCK** light is on produces the lowercase letter on the keycap. In TI mode, pressing the **SHIFT** key while the **CAPS LOCK** light is on produces uppercase letters.

Cursor-Control Keys

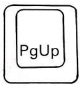




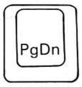
Moves the cursor in the direction indicated by arrows (up, down, right, and left)



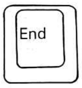
Moves the cursor to the top, left corner of the screen; may operate differently when using different software



In PC-AT mode, used to page up; returns to the previous screen; in TI mode, functions the same as the **ESC** key; may operate differently depending on the software you are using

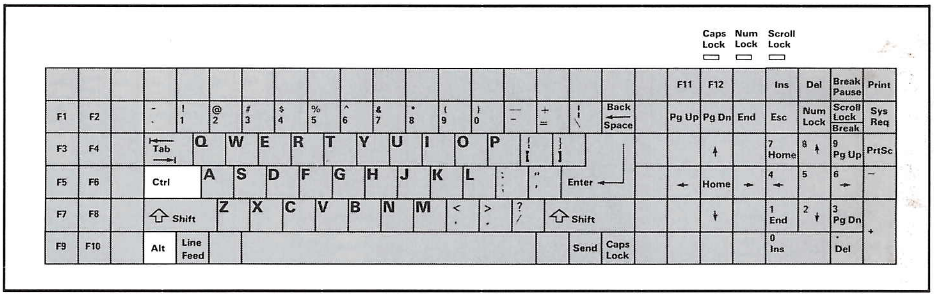


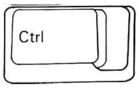
Works only in PC-AT mode; used to page down; advances to the next screen; may operate differently depending on the software you are using



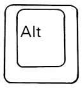
Works only in PC-AT mode; moves cursor to the last character of a line of text; may operate differently depending on the software you are using

CTRL and ALT Keys





Used with other keys to produce control codes



Used with other keys to produce characters not shown on the keycaps; these characters are called alternate characters and symbols

Control Codes

In general, control codes are commands that control the system in some way; they do not produce characters on the screen. For example, the backspace control code does not produce a character but causes the cursor to move back one space. Refer to Appendix D for more information about control codes.

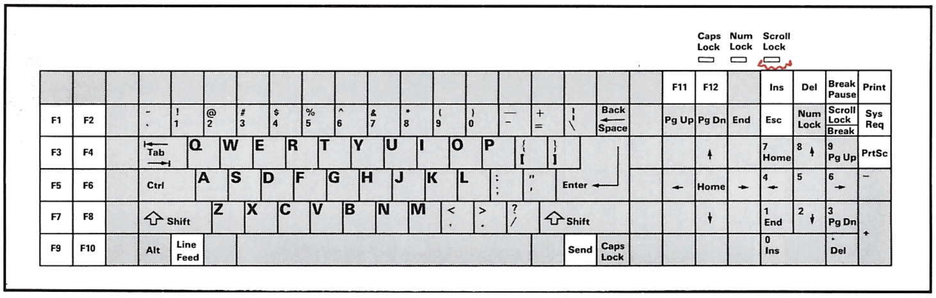
Alternate Character Set

The character set of the system (the set of all the characters your system can produce) can be divided into two groups: the characters on the keycaps and the alternate character set. The alternate character set contains accented letters, graphic symbols, Greek letters, and many other types of characters. Refer to Appendix C for more information about the character set.

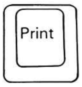
Warmstarting the System

If your system appears to not respond to keyboard input, you may want to warmstart your system. If you press the **DEL** key while pressing and holding down the **CTRL** and **ALT** keys, your system will perform a warmstart. Performing a warmstart is similar to turning on and off your system except it takes less time.

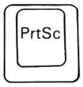
Function Keys



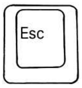
F1 → F12	Used instead of a combination of other keys; may also perform special tasks not available by using other keys; operate differently depending on software you are using; **F11** and **F12** work only in TI mode
Send	Causes the system either to accept a line of text or execute a command you have typed and then moves the cursor to the beginning of a new line; operates differently depending on the software you are using
Ins	Used to insert a character in front of a highlighted character; operates differently depending on the software you are using
Del	Used to delete the character highlighted by the cursor; operates differently depending on the software you are using
Break Pause	When pressed, pauses (stops temporarily) an operation in progress; when shifted in TI mode, breaks (terminates) an operation in progress; operates differently depending on the software you are using
Scroll Lock Break	Works only in PC-AT mode; when pressed with the **CTRL** key, terminates an operation in progress; operates differently depending on the software you are using (The **SCROLL LOCK** light comes on when the key is active.)



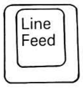
Used to send information displayed on the screen to the printer; operates differently depending on the software you are using



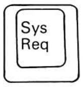
Works only in PC-AT mode; used to print the contents of the screen; when shifted, the print screen key causes the entire screen to be printed; when this key is pressed with the **CTRL** key, the system starts (or stops) printing characters as they are typed



Causes the software to escape (exit) a task that is in progress; also used as the first keystroke of some commands that consist of two or more keystrokes; operates differently depending on the software you are using

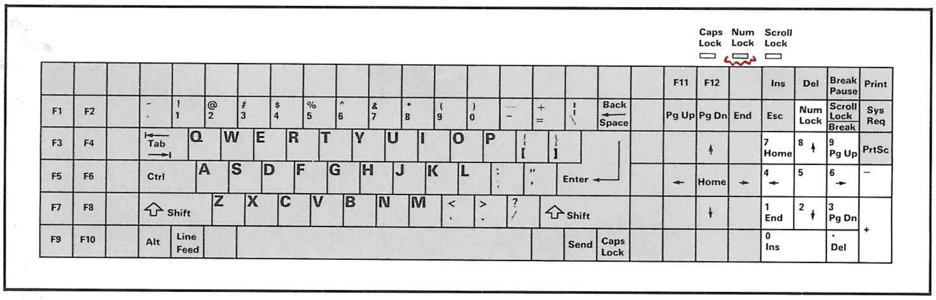


Causes the system to perform a line feed, which usually moves the cursor down one line; operates differently depending on the software you are using



Works only in PC-AT mode; the system request key operates differently depending on the software you are using

Keys on the Numeric Keypad



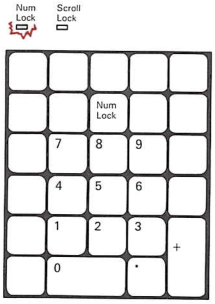
Using the Numeric Keypad

The keys on the numeric keypad are duplicated elsewhere on the keyboard. This keypad makes it more convenient to type long series of numbers and to give some commands that control your system. Whether you can use the commands or not depends on the mode you have selected.

- In PC-AT mode, you switch between numbers and commands using the **NUM LOCK** key. When the **NUM LOCK** light is on, the numbers on the numeric keypad are active. When the **NUM LOCK** light is off, the command keys are active.
- In TI mode, only the numbers on the numeric keypad are active. Some TIPC software may cause the numeric keypad to function as the numeric keypad on a TIPC keyboard. For example, when you press the – key, your system would produce a comma instead.

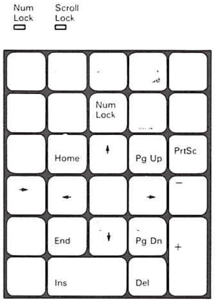
Using the Keypad for Numbers

In both PC-AT mode and TI mode, you can produce numbers using the numeric keypad. When you are using PC-AT mode, however, you need to make sure the **NUM LOCK** light is on.



Using the Keypad for Commands

In PC-AT mode, you can use the following keys to give commands that control your system. When you are using PC-AT mode, you need to make sure the **NUM LOCK** light is off.



Using the SHIFT Key With the NUM LOCK Key

In PC-AT mode, pressing the **SHIFT** key while the **NUM LOCK** light is on produces the commands on the numeric keypad. Pressing the **SHIFT** key while the **NUM LOCK** light is off produces the numbers on the numeric keypad.

Using the CTRL Key With the NUM LOCK Key

In PC-AT mode, pressing the **NUM LOCK** key while pressing the **CTRL** key causes the operation in progress to pause. Pressing any key except the **NUM LOCK** key resumes the operation.

Chapter 5: Software and Your System

An introduction to software is provided in this chapter. It describes how software affects your system and how you use software to produce information.

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How Hardware and Software Work Together 5-2
Varieties of Software 5-6
Versions of Software 5-7
Data Files and Software 5-8

How Hardware and Software Work Together

To control your system, you need to understand the major elements of your system and how they work together.

Elements of a System

Your system consists of both hardware and software.

- Hardware is the physical part of the system, including the system unit, internal options, and external devices.
- Software is a set of instructions, or programs, that control the operation of the hardware. Software is stored on a floppy diskette or Winchester drive and must be present in internal memory for hardware to work.

Two types of software are the operating system, which determines the general, overall operation of the system, and application programs, which perform specific tasks (such as, data processing and communications).

An application program can be either a predesigned program, such as Lotus 1-2-3™, or a program you design yourself using a programming language, such as MS™-BASIC.

What Is an Operating System?

An operating system consists of core programs that contain the basic rules for system management. Core programs must be in internal memory the entire time you are using the system. Most operating systems also have utility programs that are used occasionally to perform specific functions, such as preparing a floppy diskette for use. A utility program is in internal memory only while you are using it. The combination of the core programs and the utility programs is sometimes called a system disk and sometimes just an operating system.

Lotus and 1-2-3 are trademarks of Lotus Development Corporation.

MS is a trademark of Microsoft Corporation.

Operating System and Hardware

An operating system provides the basic rules that determine how the keyboard, display unit, floppy drives, internal memory, printer, and other hardware components work together.

For example, an operating system tells the hardware what data to move from internal memory to a storage medium and where to store it on the medium. Similarly, an operating system tells the hardware where data is located on a storage medium and how to move the data back into internal memory.

Application Programs and Hardware

Many application programs do not affect hardware directly. Instead, they use the operating system to control the hardware.

Some application programs require specific hardware. For example, application programs written for the TIPC require a TI Mode CRT Controller.

Application Programs and Operating System

Each application program is compatible with the core programs of a specific operating system. You need to make sure the application program and the operating system can work together.

How You Control the System

You can control the system by giving commands to the software, either the operating system or the application program. You can give commands in two ways.

- Typing a word that the software recognizes as a command when you press the **ENTER** key. For example, typing COPY and pressing the **ENTER** key can instruct the software to copy a file.
- Pressing a key that instructs the software to perform a specific function. For example, pressing the **PRINT** key can instruct the software to print a character.

How Hardware and Software Work Together (Continued)

When you give a command from the keyboard, the hardware and software together perform a series of small tasks to carry out the command.

Example

The following example shows how the operating system and an application program might work together to print something.

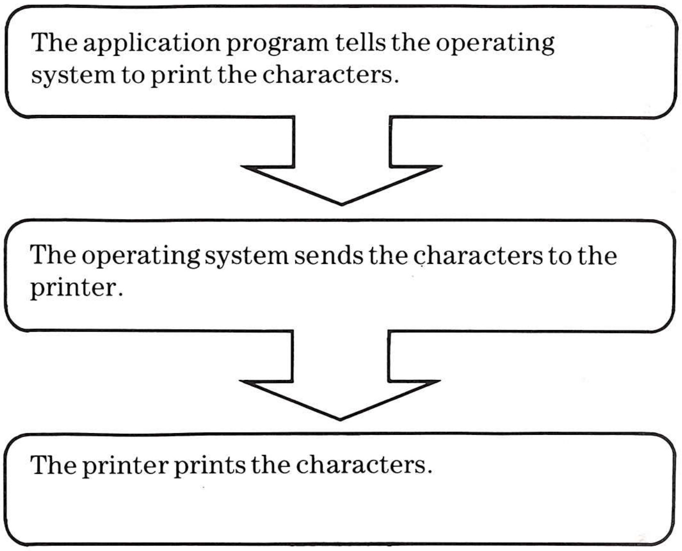
You press and hold the **SHIFT** key while pressing the **PRINT** key on the keyboard.

The keyboard sends a signal to the operating system.

The operating system sends the signal to the application program.

The application program determines what to print.

Example (Continued)



The application program tells the operating system to print the characters.

The operating system sends the characters to the printer.

The printer prints the characters.

Varieties of Software

Your system can do many things depending on the software you use. Many varieties of software work with your system. When you choose an operating system and different application programs, make sure they are compatible with each other and with the BUSINESS-PRO Computer.

Varieties of Operating Systems

Different operating systems are available from Texas Instruments and other companies; however, only an operating system from Texas Instruments, such as MS™-DOS, can take advantage of the special features of the BUSINESS-PRO Computer.

For example, although you can use an operating system designed for the PC AT, you lose the following features of the BUSINESS-PRO Computer.

- Turbo operation
- The option of using up to four floppy drives and four Winchester drives
- The ability to use TIPC software

Varieties of Application Programs

Different application programs are available from Texas Instruments and other companies. The application programs you select must be compatible with both the operating system and the hardware.

With application programs, you can either create your own programs by using such languages as BASIC or FORTRAN, or you can use predesigned programs. Predesigned application programs are available for the following.

- General business purposes, such as accounting and word processing
- Specific business purposes, such as real estate and medical record keeping

MS is a trademark of Microsoft Corporation.

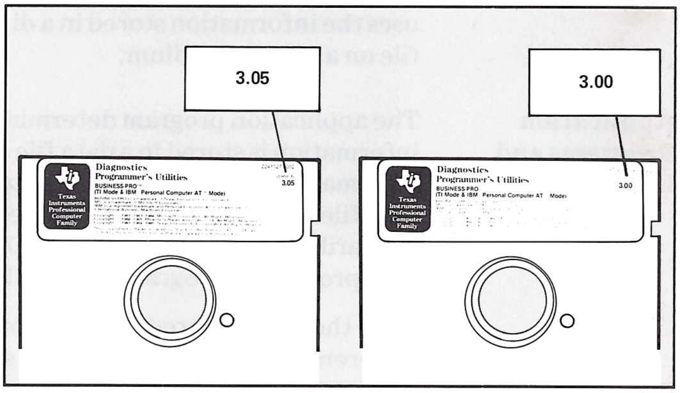
Versions of Software

Manufacturers of software frequently release new versions of their products that incorporate corrections or new features. If you buy a new version of software, make sure it is compatible with the software that you have already.

Version Numbers

When a new version of an operating system or application program is released, a new version number is assigned to it.

A label with a greater version number indicates that a version is more advanced, as shown below.


3.05
3.00
Diagnostics
Programmer's Utilities
BUSINESS PRO
(TI Mode & IBM Personal Computer AT Mode)
Texas Instruments Professional Computer Family
3.05
Diagnostics
Programmer's Utilities
BUSINESS PRO
(TI Mode & IBM Personal Computer AT Mode)
Texas Instruments Professional Computer Family
3.00

Versions of the Operating System

A new version of an operating system often works with application programs that were compatible with an earlier version of the same operating system. You can usually buy a later version of your operating system without replacing any of your application programs.

Versions of Application Programs

You can usually use a more advanced version of an application program without losing work that was done with an earlier version. For example, if you buy a new version of a word processing program, you can probably use documents created with an earlier version of the same word processing program.

Most new versions of an application program are written for the current version of an operating system. To run the new version of an application program, you may need to buy a later version of your operating system.

Data Files and Software

When you run an application program, the resulting letters, reports, or spreadsheets are stored in data files on a floppy diskette or a Winchester drive. How data files are stored and the commands you use to manage them depend on the operating system and the application program.

Operating System and Data Files

The operating system determines how data files are stored and provides the commands you need to manage the data files. Managing data files includes such tasks as copying, printing, changing, and deleting the files.

You use the operating system to retrieve the information stored in data files..The operating system uses the information stored in a directory to locate the file on a storage medium.

Application Programs and Data Files

The application program determines what kind of information is stored in a data file and how the information is arranged in the data file. For example, data files produced by word processing programs primarily contain blocks of text. Data files produced by data processing programs primarily contain numbers.

Once the data is stored in a file, you can use the data in different ways. For example, the same data file containing names and addresses could be used to produce a report, create mailing labels, and write form letters.

What Are Files and Directories?

All information is stored on a storage medium in files. These files can be either program files or data files. Program files, such as word processing software, are created by a programmer. Data files, such as letters and reports, are created by using application programs.

The difference between program files and data files is how you use them. While they are on the storage medium, program files and data files are simply units of information that are handled the same by the operating system.

The operating system stores information about files in directories. The files and directories are stored on the same storage medium. The operating system updates a directory automatically when a file is created, changed, or deleted.

All floppy diskettes and Winchester drives have at least one directory that lists the files they contain. You can look at a directory to determine which files are available on a specific drive. When you know which files are available, you can use commands in the operating system or application program to use the files.

Chapter 6: Common Software Operations

To use your system, you must know how to use software to perform the operations described in this chapter. These operations are described in general terms only, giving the principles behind the operation you want to perform. Once you understand these principles, refer to the appropriate software manual for specific commands.

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Preparing Floppy Diskettes and Winchester Drives 6-8
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Copying an Application Program for Daily Use 6-15
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Using Files and Directories 6-20
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Reducing the Effect of Problems in Using Software 6-28

Using the Chapter

By reviewing the operations in this chapter, you can learn about those basic operations all computer users need to perform.

Floppy Drives Used in Operations

The software operations presented in this chapter assume that you have two drives — either two floppy drives or one floppy drive and a Winchester drive.

If you have only one floppy drive and no Winchester drive, you can still perform all of the operations. By switching floppy diskettes in and out of a single floppy drive, a single floppy drive can function as two floppy drives. See your operating system manual for instructions for using a system with a single floppy drive.

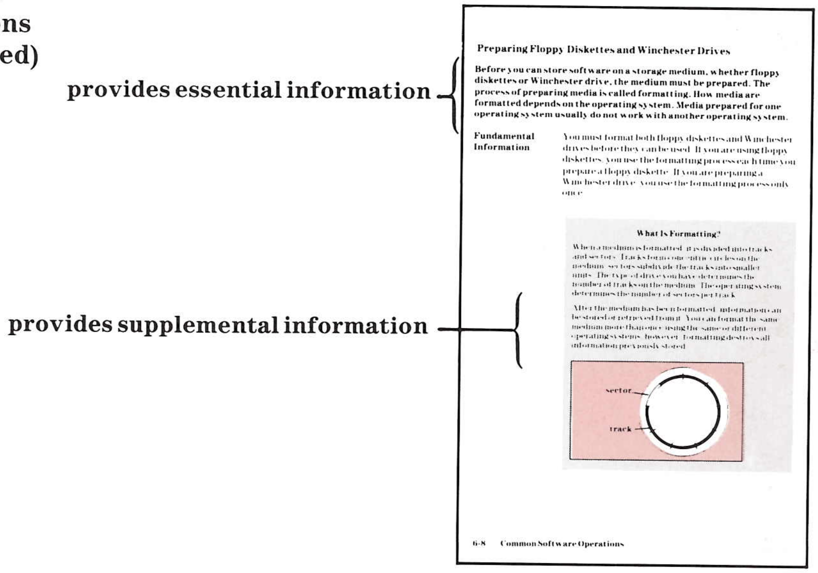
How to Use Software Operations

The specific commands used by an operating system or application program vary; however, the general tasks you perform are similar for most types of software.

Each software operation in this chapter includes the general tasks you will need to perform and basic concepts involved in the operation. Because operations are presented sequentially and rely on information explained in previous operations, you should review the entire chapter. Then use the manuals for your operating system and application programs to determine specific commands and procedures.

How to Use Software Operations (Continued)

The software operation shown below is typical.


provides essential information
provides supplemental information
sector
track

Preparing Floppy Diskettes and Winchester Drives

Before you can store software on a storage medium, whether floppy diskettes or Winchester drive, the medium must be prepared. The process of preparing media is called formatting. How media are formatted depends on the operating system. Media prepared for one operating system usually do not work with another operating system.

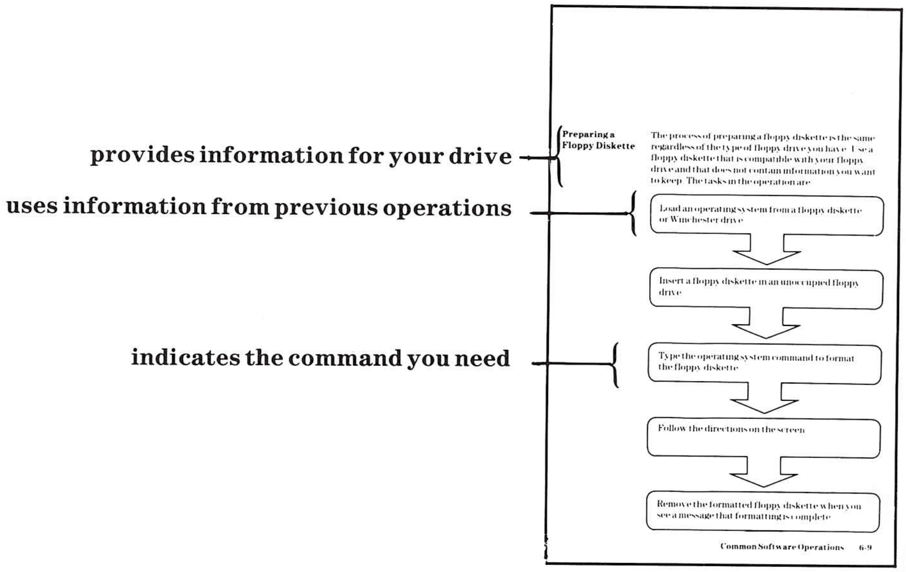
Fundamental Information You must format both floppy diskettes and Winchester drives before they can be used. If you are using floppy diskettes, you use the formatting process each time you prepare a floppy diskette. If you are preparing a Winchester drive, you use the formatting process only once.

What Is Formatting?

When a medium is formatted, it is divided into tracks and sectors. Tracks form concentric circles on the medium; sectors subdivide the tracks into smaller units. The type of drive you have determines the number of tracks on the medium. The operating system determines the number of sectors per track.

After the medium has been formatted, information can be stored or retrieved from it. You can format the same medium more than once using the same or different operating systems; however, formatting destroys all information previously stored.

6-8 Common Software Operations


provides information for your drive
uses information from previous operations
indicates the command you need

Preparing a Floppy Diskette The process of preparing a floppy diskette is the same regardless of the type of floppy drive you have. Use a floppy diskette that is compatible with your floppy drive and that does not contain information you want to keep. The tasks in the operation are:

Load an operating system from a floppy diskette or Winchester drive

Insert a floppy diskette in an unoccupied floppy drive

Type the operating system command to format the floppy diskette

Follow the directions on the screen

Remove the formatted floppy diskette when you see a message that formatting is complete

Common Software Operations 6-9

Loading an Operating System

The first step in using the system is loading the operating system. To load the operating system, the system must retrieve the operating system from a floppy diskette or Winchester drive and put the operating system into internal memory.

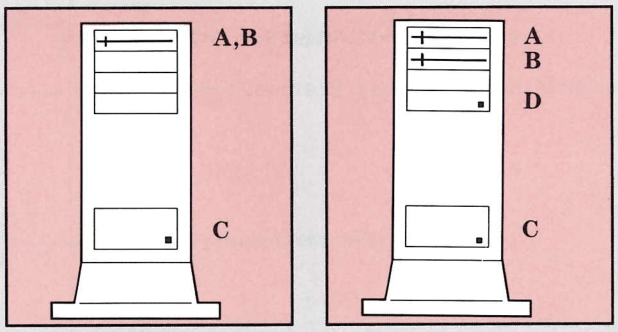
Fundamental Information

When the system is turned on, the system unit searches for an operating system. It checks the floppy drives first, then the Winchester drives. This sequence is built into the system unit; however, by using the Start-Up program on the Diagnostics diskette, you can select a different sequence. (Refer to your *Diagnostics User's Guide* for instructions on how to run the Start-Up program.)

You can direct the system unit to check any drive first; however, the most common change is to have the system unit check the Winchester drive first. If you change the sequence, you can return temporarily to the built-in sequence (checking the floppy drives first) without running the Start-Up program again.

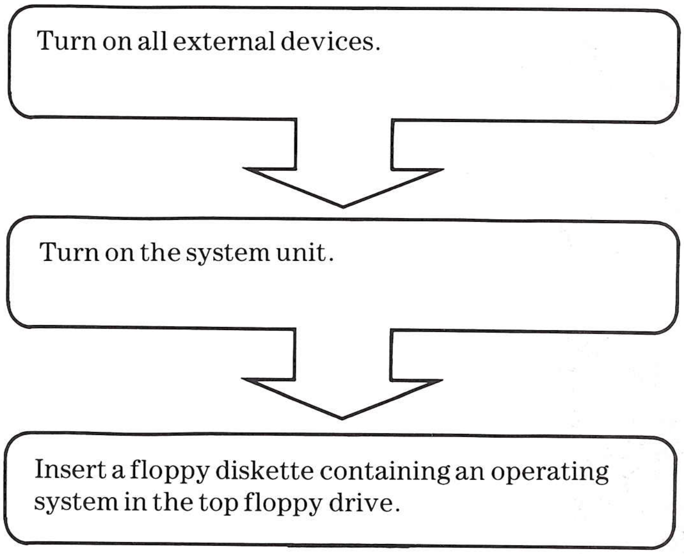
How Are Drives Designated?

When using software, you direct the system unit to the correct drive by using a drive designation. The operating system determines whether drives are designated by letters, numbers, or a combination of both. A commonly used method for drive designation is illustrated below.



Loading an Operating System From a Floppy Diskette

If you regularly load the operating system from a floppy diskette, you should leave the built-in sequence unchanged. When using the built-in sequence, the tasks in the operation are:



Turn on all external devices.

Turn on the system unit.

Insert a floppy diskette containing an operating system in the top floppy drive.

Once you turn on the system unit, it performs the self-test, checks the floppy diskette for the operating system, and loads the operating system into internal memory.

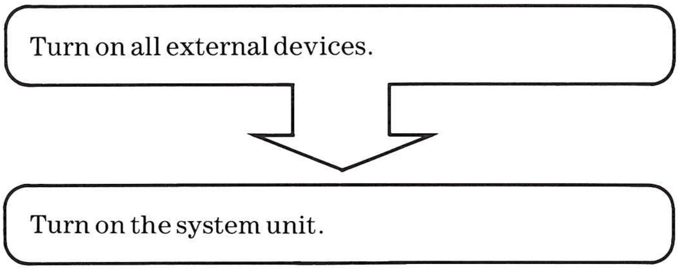
The procedure that occurs next varies with the operating system. For example, the operating system may ask for the time and date, a password, or other identification. Once the procedure is complete, a message appears on the screen indicating the operating system is ready to receive a command.

Loading an Operating System (Continued)

The fundamental information about loading an operating system applies to both floppy drives and Winchester drives; however, the specific tasks in loading an operating system from a Winchester drive are different.

Loading an Operating System From a Winchester Drive

If the Winchester drive contains an operating system, you should change the sequence so the system unit checks the Winchester drive first. The tasks in the operation are:



Turn on all external devices.

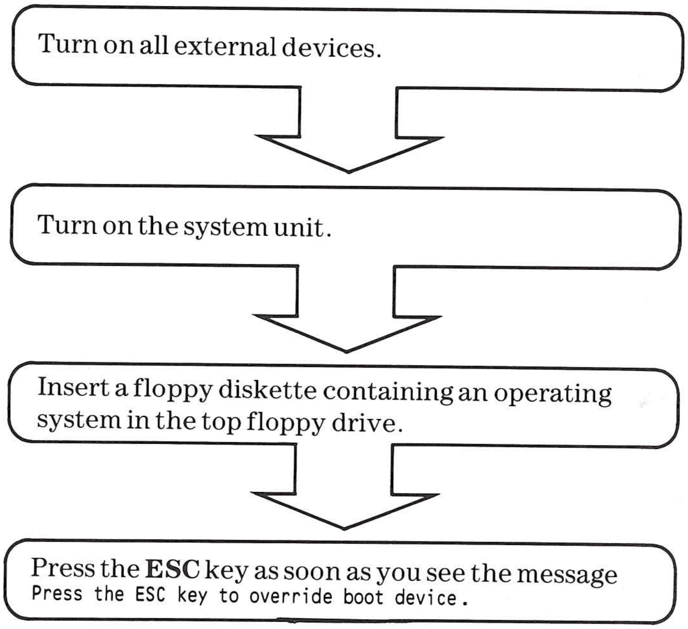
Turn on the system unit.

Once you turn on the system unit, it performs the self-test, checks the Winchester drive for the operating system, and loads the operating system into internal memory.

The procedure that occurs next varies with the operating system. For example, the operating system may ask for the time and date, a password, or other identification. Once the procedure is complete, a message appears on the screen indicating the operating system is ready to receive a command.

Loading From a Floppy Diskette Instead of a Winchester Drive

Although you usually load an operating system from a Winchester drive, you can load an operating system from a floppy diskette. Without running the Start-Up program, you can direct the system unit to check for the operating system in the floppy drive. The tasks in the operation are:



Turn on all external devices.

Turn on the system unit.

Insert a floppy diskette containing an operating system in the top floppy drive.

Press the **ESC** key as soon as you see the message `Press the ESC key to override boot device.`

Preparing Floppy Diskettes and Winchester Drives

Before you can store software on a storage medium, whether floppy diskettes or Winchester drive, the medium must be prepared. The process of preparing media is called formatting. How media are formatted depends on the operating system. Media prepared for one operating system usually do not work with another operating system.

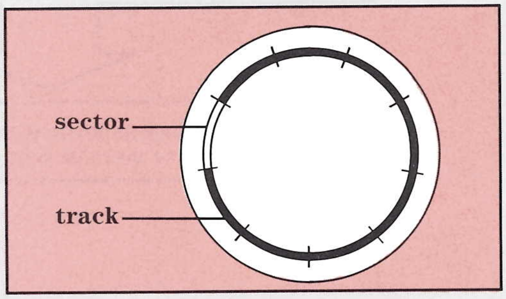
Fundamental Information

You must format both floppy diskettes and Winchester drives before they can be used. If you are using floppy diskettes, you use the formatting process each time you prepare a floppy diskette. If you are preparing a Winchester drive, you use the formatting process only once.

What Is Formatting?

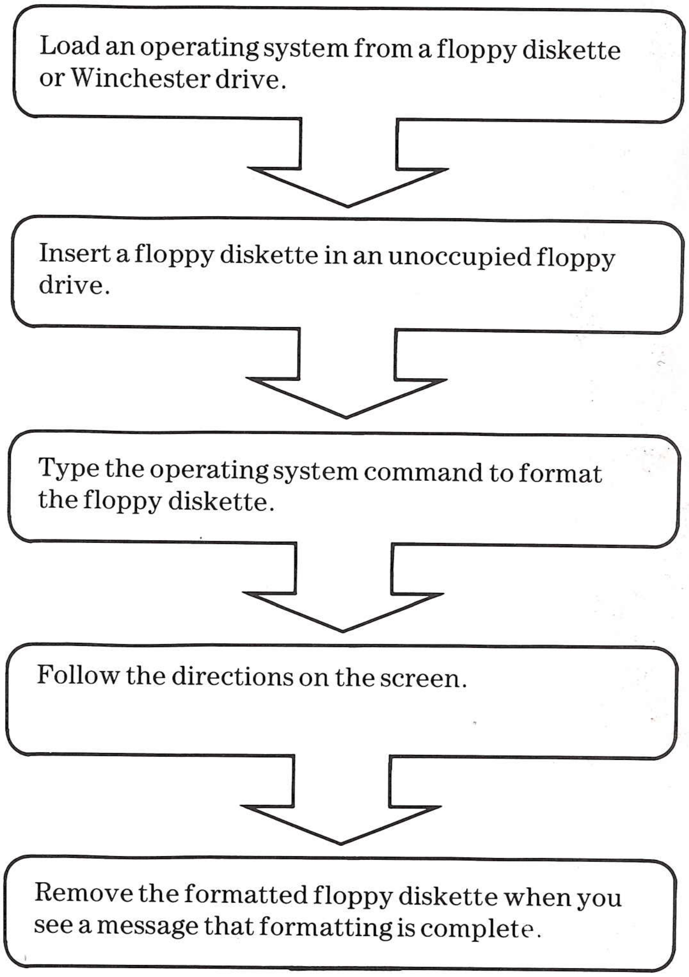
When a medium is formatted, it is divided into tracks and sectors. Tracks form concentric circles on the medium; sectors subdivide the tracks into smaller units. The type of drive you have determines the number of tracks on the medium. The operating system determines the number of sectors per track.

After the medium has been formatted, information can be stored or retrieved from it. You can format the same medium more than once using the same or different operating systems; however, formatting destroys all information previously stored.



Preparing a Floppy Diskette

The process of preparing a floppy diskette is the same regardless of the type of floppy drive you have. Use a floppy diskette that is compatible with your floppy drive and that does not contain information you want to keep. The tasks in the operation are:



Load an operating system from a floppy diskette or Winchester drive.

Insert a floppy diskette in an unoccupied floppy drive.

Type the operating system command to format the floppy diskette.

Follow the directions on the screen.

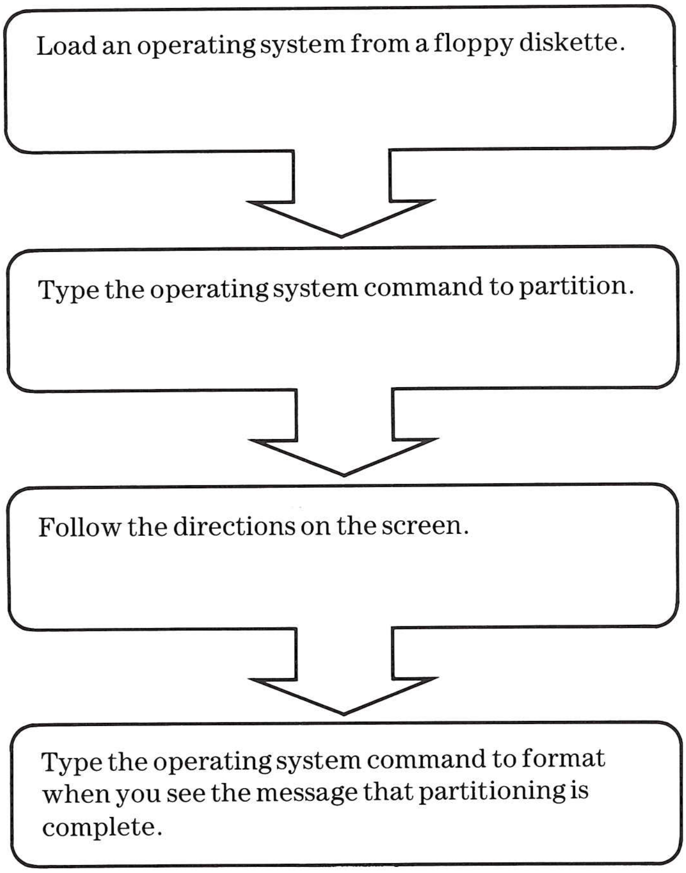
Remove the formatted floppy diskette when you see a message that formatting is complete.

Preparing Floppy Diskettes and Winchester Drives (Continued)

The fundamental information about using format to prepare media applies to both floppy drives and Winchester drives. However, preparing a Winchester drive also involves partitioning. You must partition the Winchester drive, even if you are assigning the entire Winchester drive to a single partition.

Preparing a Winchester Drive

Before you prepare your Winchester drive, make sure that the Winchester drive is blank or that you have copied any information you want to keep. The tasks in the operation are:



Load an operating system from a floppy diskette.

Type the operating system command to partition.

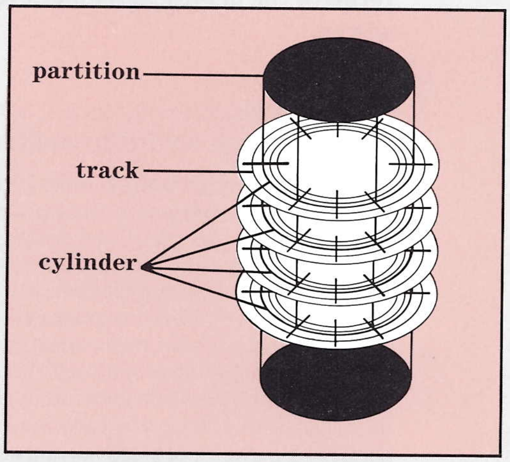
Follow the directions on the screen.

Type the operating system command to format when you see the message that partitioning is complete.

What Is Partitioning?

By partitioning a Winchester drive, you can put more than one operating system on the Winchester drive. In this way, you can store on the same Winchester drive application programs designed to be used with different operating systems. Partitioning divides a Winchester drive into a maximum of four work areas, each with a different operating system.

During partitioning, you can either assign the entire Winchester drive to one partition or only a specific number of cylinders. A cylinder consists of the same track on each of the platters in the Winchester drive.



Copying an Operating System for Daily Use

To protect your operating system from damage or loss, you should make a copy of the programs and store the original in a safe place. Use the copy (called the working copy) for daily use.

Fundamental Information

When you make a working copy of the operating system, you should copy both parts of the operating system.

- Core programs — allow you to use the key commands of the operating system, which are often called internal commands
- Utility programs — allow you to use the other commands of the operating system, which are often called external commands

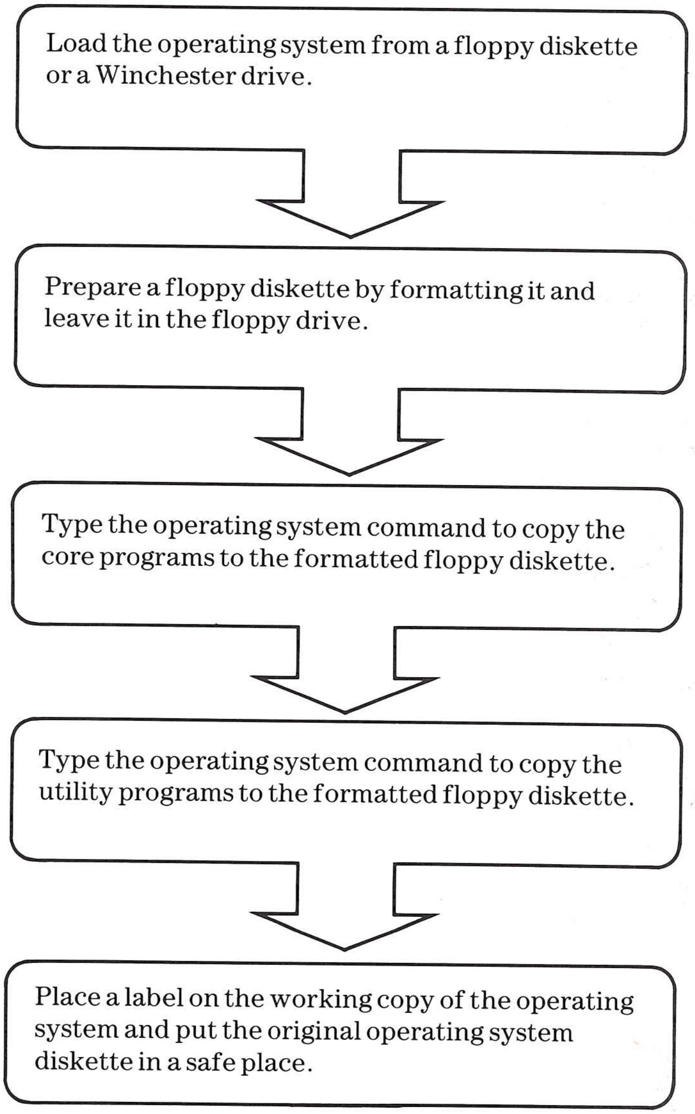
Companies that sell operating systems have restrictions on copying. Before making a working copy, read the terms of the license agreement for your operating system.

What Are Utility and Core Programs?

An operating system diskette contains core programs and utility programs. Utility programs, however, differ from core programs. Core programs must be in internal memory any time you use the system. Utility programs are stored on a floppy diskette or Winchester drive until you use them. Core programs allow you to use internal commands, which are necessary for day-to-day operations, such as copying files. Utility programs allow you to use external commands, which are needed occasionally for operations, such as copying an entire floppy diskette or partitioning a Winchester drive.

Copying an Operating System to a Floppy Diskette

The tasks for the operation are:



Load the operating system from a floppy diskette or a Winchester drive.

Prepare a floppy diskette by formatting it and leave it in the floppy drive.

Type the operating system command to copy the core programs to the formatted floppy diskette.

Type the operating system command to copy the utility programs to the formatted floppy diskette.

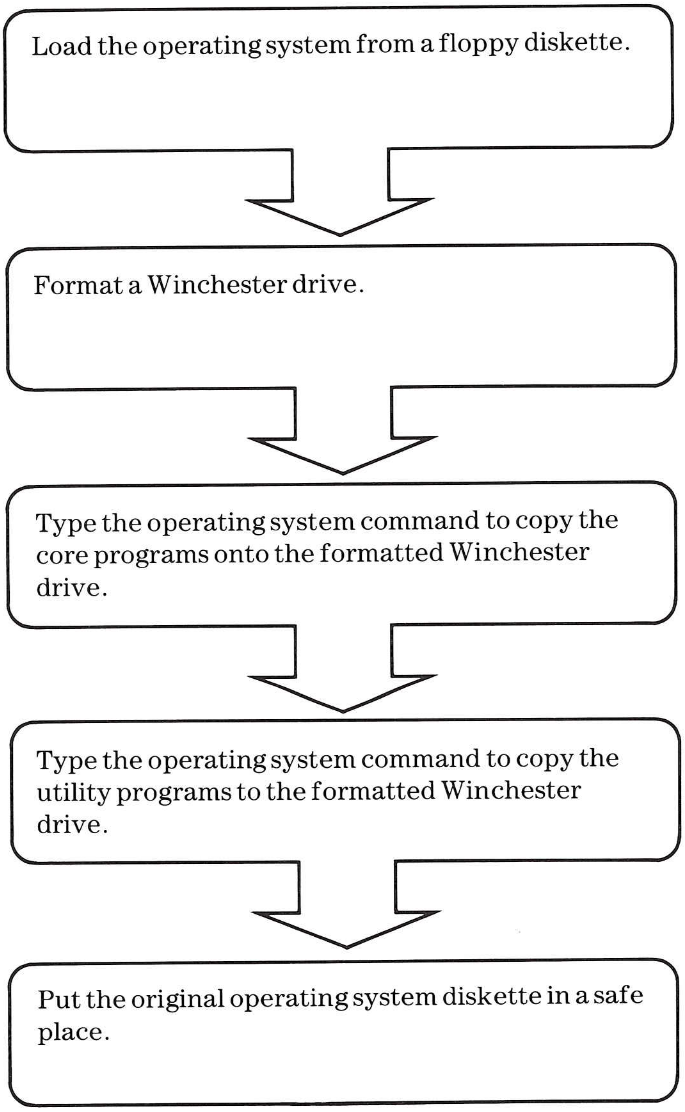
Place a label on the working copy of the operating system and put the original operating system diskette in a safe place.

Copying an Operating System for Daily Use (Continued)

When copying an operating system onto a Winchester drive, you also need to copy both parts of the operating system.

Copying an Operating System to a Winchester Drive

The tasks for the operation are:



Load the operating system from a floppy diskette.

Format a Winchester drive.

Type the operating system command to copy the core programs onto the formatted Winchester drive.

Type the operating system command to copy the utility programs to the formatted Winchester drive.

Put the original operating system diskette in a safe place.

Copying an Application Program for Daily Use

Just as you need to make a working copy of an operating system, you need to make a working copy of an application program. The original application program should be stored in a safe place.

Fundamental Information

An application program cannot work without having the core programs in internal memory. You load the core programs from a floppy diskette or a Winchester drive and then load the application program.

To reduce the steps involved in loading the programs, both the core programs and the application program can be stored on the same medium. You can store the programs on a floppy diskette or on a Winchester drive.

Companies that sell application programs restrict copying. For example, making a copy of an application program may be impossible. Instead, you may have to copy the core programs from the operating system diskette to the application program diskette.

Before making a working copy, read the terms of the license agreement for your operating system and application program. Since methods for copying application programs vary, refer to your application program manual for specific instructions.

Can You Use External Commands With Working Copies?

With only the core programs and the application program on the working copy, you can use internal commands but not external commands. For example, with some operating systems you can copy a file or show a directory, but you cannot make a copy of a floppy diskette or format media.

To use external commands, you need to either:

- Store both the core programs and the utility programs on the Winchester drive
- Load both the core programs and the utility programs into internal memory from a floppy diskette containing the operating system

Copying an Application Program for Daily Use (Continued)

The following processes describe one method for making a working copy of an application program on a floppy diskette or a Winchester drive. Your application program may have specific requirements described in the application program manual.

Copying an Application Program to a Floppy Diskette

The tasks in the operation are:

Load the operating system from a floppy diskette.

Prepare a floppy diskette by formatting it and leave it in the floppy drive.

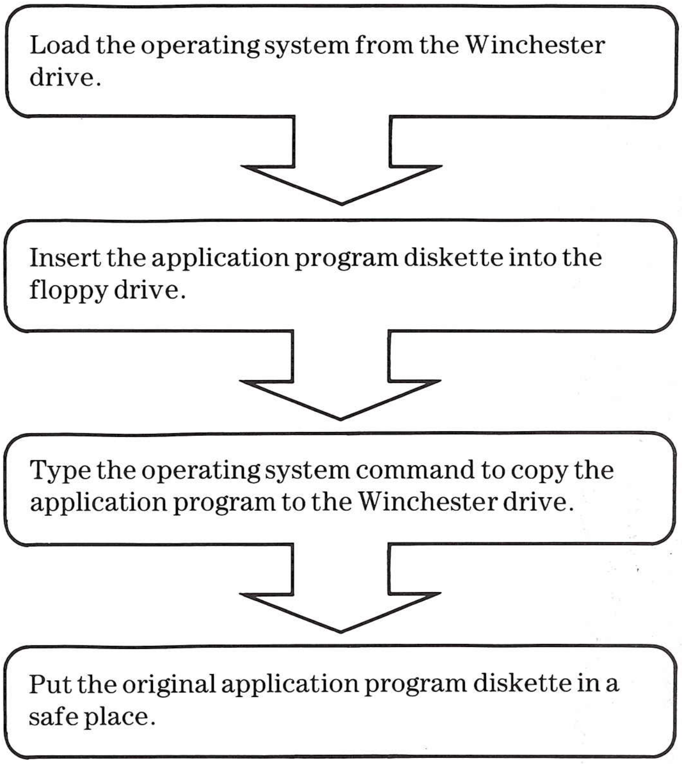
Type the operating system command to copy the core programs to the formatted floppy diskette.

Type the operating system command to copy the application program to the formatted floppy diskette.

Label the working copy and put the original application program diskette in a safe place.

Copying an Application Program to a Winchester Drive

The following process assumes the operating system has already been copied to the Winchester drive. The tasks in the operation are:



Load the operating system from the Winchester drive.

Insert the application program diskette into the floppy drive.

Type the operating system command to copy the application program to the Winchester drive.

Put the original application program diskette in a safe place.

Running an Application Program

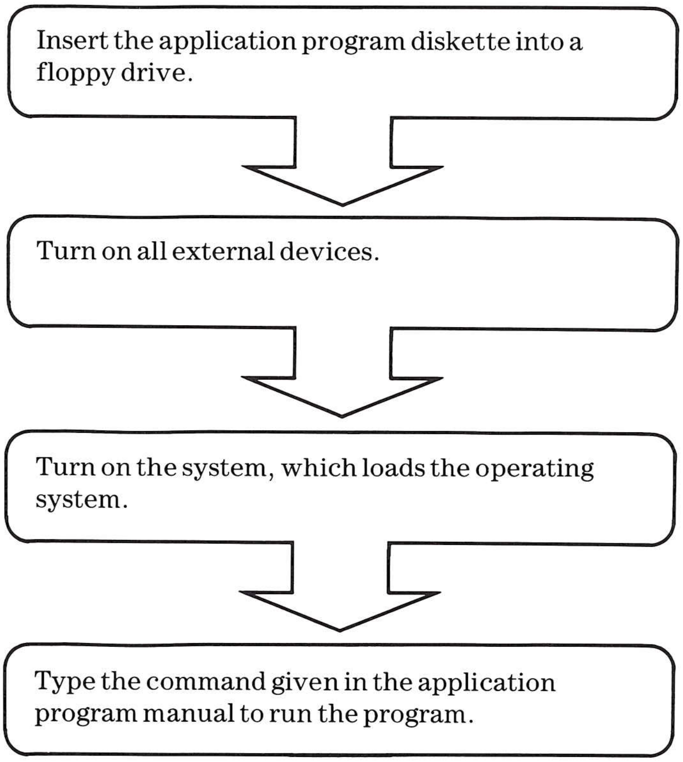
Whether you want to use a data processing program, a programming language, or any other type of application program, the process for running the program is the same.

Fundamental Information

The command needed to run an application program varies with the application program. Refer to the application program manual for the exact command and for any other commands needed to use the program.

Running a Program From a Floppy Diskette

The following process assumes the application program and the operating system are on the same floppy diskette. The tasks in the operation are:



Insert the application program diskette into a floppy drive.

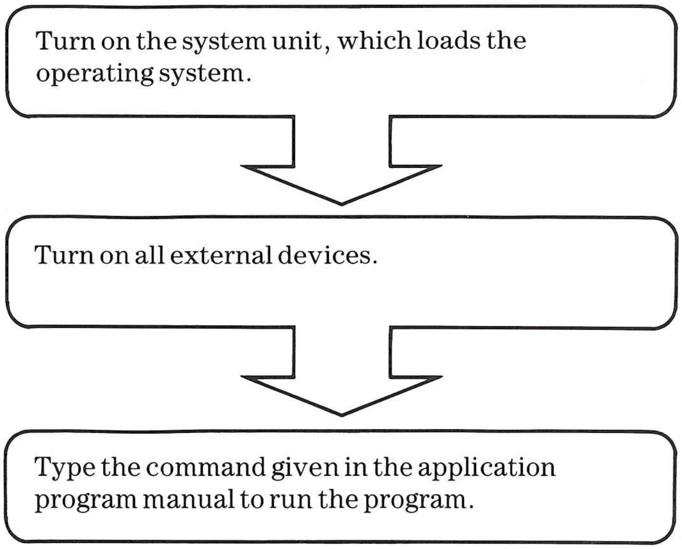
Turn on all external devices.

Turn on the system, which loads the operating system.

Type the command given in the application program manual to run the program.

Running a Program From a Winchester Drive

This process assumes the application program and the operating system are on the Winchester drive. The tasks in the operation are:



Turn on the system unit, which loads the operating system.

Turn on all external devices.

Type the command given in the application program manual to run the program.

Using Files and Directories

Whether you store files on floppy diskettes or a Winchester drive, you need to know how to create and manage files and directories. The way you manage files and directories depends on the specific needs of your business.

Fundamental Information

All information is stored in files. Information about the files, such as the name and size of the files, is stored in directories.

If you have a large number of files, you need to develop a way to organize the files. The method you choose depends on whether you store your files on floppy diskettes or Winchester drives.

- If you are storing information on floppy diskettes, the floppy diskettes themselves become part of the organization. By including similar files on the same floppy diskette, you can control which files you see at one time.
- If you are storing information on a Winchester drive, you need to create additional directories, or subdirectories. Using subdirectories on a Winchester drive gives you the same kind of organization you can get by using different floppy diskettes.

What Are Directories and Subdirectories?

Each floppy diskette and Winchester drive has a primary directory, which is sometimes called the main directory or the root directory. The primary directory can contain the names of files or the names of other directories.

These other directories are called subdirectories. Subdirectories contain information about additional files not found in the primary directory. Depending on the number of files on the floppy diskette or Winchester drive, you may want to create another level of organization. Your subdirectories then contain their own subdirectories.

Creating Files and Directories

You can use either an operating system or an application program to create files and directories. The first step in creating a file or directory is giving it a name that no other file or directory has.

The operating system establishes the basic guidelines for naming files and directories. Although each operating system has different guidelines, all operating systems place the following kinds of limitations on a name.

- The characters you can use
- The maximum number of characters

Refer to the operating system manual for specific information about naming files and directories. You also need to refer to the manual for the application program you are using because some application programs have additional restrictions on the names you can use.

Managing Files and Directories

An operating system has commands for managing files and directories. With both files and directories, you can perform such tasks as renaming, deleting, copying, showing, and printing.

For example, you can use operating system commands to change the name of a file without changing the contents. You can also delete a file or directory.

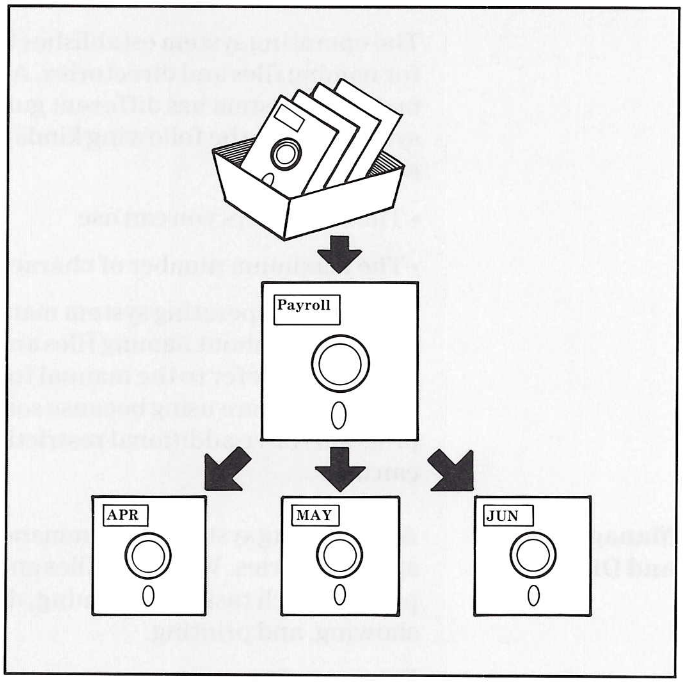
All operating systems allow you to copy a file, and some operating systems allow you to copy directories as well. By using the operating system, you can show on the screen or print on paper the contents of a directory or the contents of a file.

Refer to the operating system manual for the specific commands you need to manage files and directories.

The way you organize your files depends on whether you are using floppy diskettes or a Winchester drive. The following two illustrations show how floppy diskettes and subdirectories can be used to organize the files coming from an application program that processes payroll information.

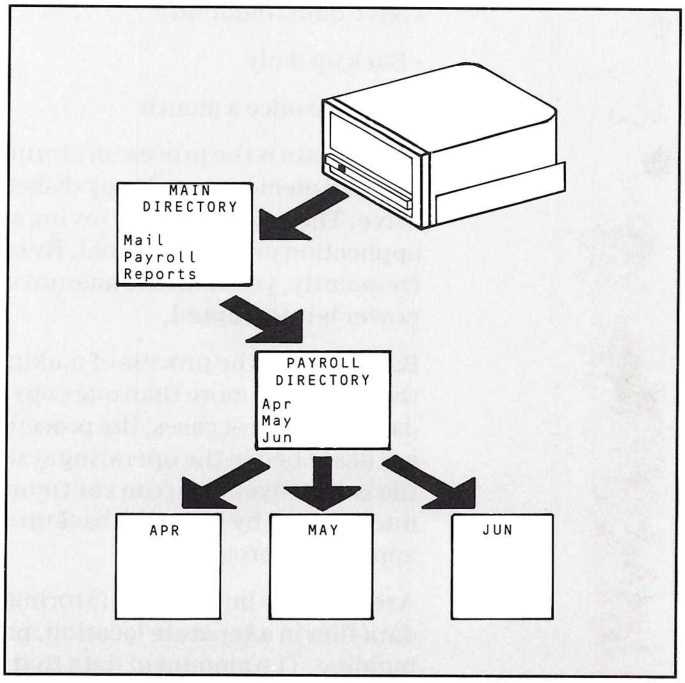
Organizing Files on Floppy Diskettes

When using floppy diskettes, it is usually advisable to use different floppy diskettes to separate different groups of files.



Organizing Files on Winchester Drives

When storing files on a Winchester drive, it is usually advisable to use subdirectories to separate different groups of files.



Protecting Your Data

When using your system, you spend most of your time working with data, which stays in internal memory until stored on a floppy diskette or Winchester drive. By implementing a few simple practices, you can protect the data you have been working on. The method you follow depends on the storage devices you have.

Fundamental Information

Regardless of the type of system you have, you should implement these practices to protect against loss of data.

- Save data frequently
- Back up daily
- Archive once a month

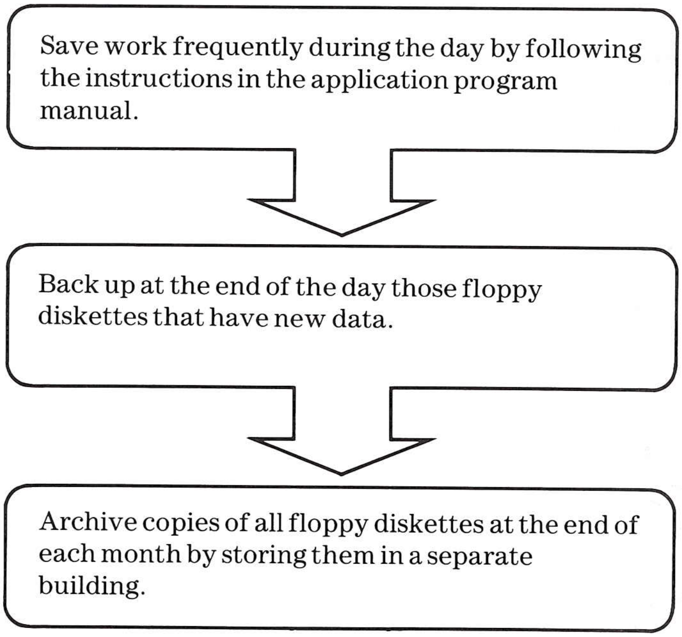
Saving data is the process of storing the data that is in internal memory to a floppy diskette or a Winchester drive. The procedures for saving are described in the application program manual. By saving data frequently, you limit the amount of data you lose if the power is interrupted.

Backing up is the process of making a copy of a file so that you have more than one copy in the event of loss or damage. In most cases, the procedures for backing up are described in the operating system manual. If a data file is destroyed, you can continue without interruption by using the backup copy with the application program.

Archiving is the process of storing backup copies of data files in a separate location, preferably in another building. The amount of data that you generate determines how often you should archive your backup copies. If your system and your records are destroyed by fire or other disaster, you can resume your business by using the archived copies on another system.

Protecting Floppy Diskettes

If you are backing up files stored on a floppy diskette, you should implement the following practices.



Save work frequently during the day by following the instructions in the application program manual.

Back up at the end of the day those floppy diskettes that have new data.

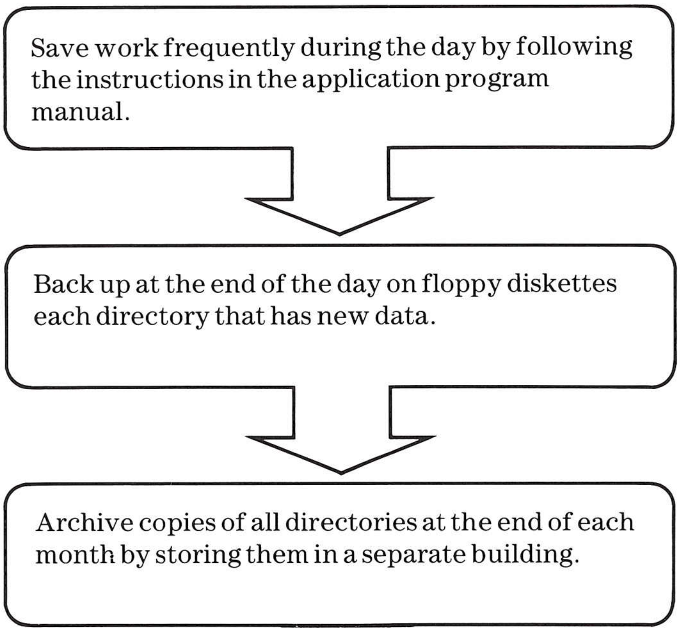
Archive copies of all floppy diskettes at the end of each month by storing them in a separate building.

Protecting Your Data (Continued)

You can back up your data files on a Winchester drive by using either a floppy drive or a tape backup. The processes are slightly different.

Protecting a Winchester Drive With Floppy Diskettes

If you are backing up data files on a Winchester drive by using a floppy drive, you will need several floppy diskettes. If a file is too large to fit on one floppy diskette, you need to use a specific operating system command to copy the file to more than one floppy diskette. When you back up your Winchester drive, implement the following practices.



Save work frequently during the day by following the instructions in the application program manual.

Back up at the end of the day on floppy diskettes each directory that has new data.

Archive copies of all directories at the end of each month by storing them in a separate building.

Protecting a Winchester Drive With a Tape

If you are backing up a Winchester drive on a tape backup, use the programs that came with the tape backup to copy data files from the Winchester drive. When you back up your Winchester drive, implement the following practices.

Save work frequently during the day by following the instructions in the application program manual.

Back up at the end of the day the files that have been changed on the Winchester drive to a tape cartridge. It is a good idea to use a different cartridge from the one used the last time you made a backup in case one is lost or damaged.

Archive a copy of the entire Winchester drive at the end of each month by storing it in a separate building.

Reducing the Effect of Problems in Using Software

Most software problems are minor and are easily corrected by following the instructions in the software manual. The most serious problems, however, are beyond your control because they are caused by power interruptions or by errors in the program. You cannot prevent these problems, but you can protect yourself against their effects.

Fundamental Information

Serious problems can have many causes. You might turn off your system accidentally. Power might be interrupted because of an electrical storm. Your copy of the program might have been damaged.

Whatever the cause, your program can stop running. You can usually tell that a program is no longer running because the system unit does not respond to the keyboard. A more disastrous consequence to these problems is loss of data. You can lose data that was in internal memory, on a floppy diskette, or on a Winchester drive.

Recovering From Problems

What you do to recover from a problem with software depends on whether the program has stopped running and whether you have lost data files.

1. If you think your program has stopped running, refer to Chapter 9, Problems Without Error Messages, before doing anything else.
2. Once you have the program running again, check to see if you have lost data. If you have lost data files, you may be able to recover these files. Refer to the operating system manual for possible commands that can recover lost files.

Avoiding Future Losses of Data

Although you cannot prevent a serious problem from occurring, you can minimize the amount of data that you lose by establishing the following practices.

- Save your work regularly while running a program
- Back up data files often

Chapter 7: Practical Considerations for Using Hardware and Software

If you need to know how common options work with software, refer to the section in this chapter describing the option. If you need to know about the hardware requirements of word processing, data processing, communications, or graphics programs, refer to the chart at the end of the chapter.

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Hardware Requirements of Application Programs 7-10

Using a CRT Controller

As the interface between the system unit and the display unit, a CRT controller controls how information is shown on the screen. The kind of CRT controller selected determines which software you can use on your system.

The CRT Controller and Your System

The BUSINESS-PRO Computer can run either TIPC or PC AT application programs. Most application programs can work with only one kind of CRT controller. To run an application program, you must have a CRT controller, an operating system, and an application program that are compatible with each other.

Two CRT controllers are available from Texas Instruments.

- TI Mode CRT Controller
- PC-AT Mode CRT Controller

TI Mode CRT Controller

When using the TI Mode CRT Controller and an operating system that works with it, your system operates in TI mode. When the system is in TI mode, you can run only software that is compatible with the TIPC. Among other things, this gives you higher resolution and more colors on the screen at one time.

TI mode affects the operation of the keyboard. For information on how TI mode affects the keyboard when using MS-DOS, see Appendix A.

PC-AT Mode CRT Controller

When using the PC-AT Mode CRT Controller and an operating system that works with it, your system operates in PC-AT mode. When the system is in PC-AT mode, you can run only software that is compatible with the PC AT.

PC-AT mode affects the operation of the keyboard. For information on how PC-AT mode affects the keyboard when using MS-DOS, see Appendix B.

CRT Controllers and the Operating System

The operating system must work with the type of CRT controller you are using. If you have both TI CRT controllers installed, you must use an operating system that works with both CRT controllers.

If you have both TI CRT controllers, you can use the operating system to change from one CRT controller to the other. When you turn on the system unit again, it begins using the CRT controller you were using last.

CRT Controllers and Application Programs

Although some application programs can work with both CRT controllers, some work with only one. Review the chart below for three ways application programs can work with CRT controllers.

Software and CRT Controller	Example
Some software works with a specific CRT controller. To use that software, you must buy the version for your CRT controller.	Graphics programs usually require the colors and resolution of a specific CRT controller.
Some software works without modification. To use the software, simply follow the instructions in the software manual.	Some compilers work with either CRT controller since compilers do not use such features of the CRT controller as graphics.
Some software requires modifications to work with a CRT controller. To use the software, follow the instructions in the software manual to modify the software for your CRT controller.	Some word processing programs, such as WordStar®, can be modified to work with either CRT controller.

WordStar is a registered trademark of Micro Pro.

Using a Printer

A wide range of printers can work with the BUSINESS-PRO Computer. When adding a printer to your system, make sure that the system unit and printer work together and that the printer works with the operating system and application programs you are using.

The Printer and Your System

The BUSINESS-PRO Computer works with two types of printers.

- Parallel printers
- Serial printers

The terms parallel and serial refer to the way the system unit sends information to the printer. To use a printer successfully, you may need to alter (configure) the operating system, application program, and printer to work together.

Parallel Printers and the Operating System

Most operating systems automatically assume you have a parallel printer. If a printer is connected to the built-in parallel port, you can use it without configuring the operating system.

Serial Printers and the Operating System

An operating system can send information to a serial printer in different ways. If you have a serial printer, make sure the way the operating system sends information to the printer matches all the settings on the printer. For example, the operating system must send characters at the same speed the printer expects to receive them.

To get the operating system and the printer to work together, you may need to configure both the operating system and printer. You usually configure the operating system by giving a command and configure the printer by setting switches in the printer. Refer to the operating system manual for information on configuring the operating system. Refer to the printer manual for information on setting the switches.

The Printer and Application Programs

The features of both the printer and the application program determine what you can produce with a printer. To use the sophisticated features of a printer, you need application programs that take advantage of those features.

How to Select a Printer

When selecting a printer, consider what you want to print, the quality and speed of printing that you need, and any special features of application programs that affect the printer.

What you want to print determines in many ways what kind of printer you need to buy. For example, to print reports and spreadsheets, you may need a printer with a wide carriage. To print forms with multiple copies, you need an impact printer (not a thermal, ink-jet, or laser printer). To print on individual envelopes or sheets of stationery, you may need a cut-sheet feeder for your printer.

Quality and speed are important considerations. In general, the price of the printer depends on the quality and speed of printing; the higher the quality, the more you pay for higher speed. You need to buy a printer that has acceptable quality and sufficient speed to meet your requirements.

Finally, the software you are using may need a printer with special features. For example, if the software can use a printer for graphics, colors, special symbols, or different type styles, you need a printer that has these features.

Using Communication Equipment

Communication equipment makes it possible to transfer information between systems. Your communication equipment must be compatible with both the communication software you are using and the system with which you are communicating.

Communication Equipment and Your System

Because systems can send and receive information in two ways, two kinds of communication equipment are available.

- Asynchronous communication equipment
- Synchronous communication equipment

Most communication software, such as TTY Communications, uses asynchronous communication equipment. Consequently, most communication equipment works with asynchronous communication software.

Some communication software, such as 3270 Communications and 3780 Communications, uses synchronous communication equipment. Although less common than asynchronous communication software, synchronous communication software sends information faster and more reliably.

How You Can Use Communication Software

You can use either asynchronous or synchronous communication software.

Asynchronous communication software is primarily used when you want to communicate with a subscription information service, send or receive electronic mail, and process using a remote system.

Synchronous communication software is primarily used to send and receive files.

Communication Equipment and Your Software

The communication software you have may only work with certain equipment. Check your communication software manual to find out which equipment works with your software.

The most common combinations of communication equipment are listed below.

- External modem connected to a TI Mode RS-232 Serial Interface. The TI Mode RS-232 Serial Interface converts characters from the system for the modem. The modem then converts those characters for transmission over telephone lines.
- External modem connected to the built-in serial port, which can be used for asynchronous communications only.
- External modem connected to a BUSINESS-PRO compatible serial communication board, which can be used for either synchronous or asynchronous communications.
- Communication board specific for the communication software that you are using, for example, 3270 Communications.

Using a Mouse

Using a mouse can simplify the way you give commands to the system. The TI Optical Mouse connects to the unoccupied connector for the keyboard cable on a TI display unit. A mouse from another manufacturer connects to either the built-in serial port or to a BUSINESS-PRO compatible option board in the system unit.

The Mouse and Your System

When you move a mouse or press a button on a mouse, it sends signals to the system unit. The way the system unit interprets these signals depends on the software you are using.

- Moving a mouse usually positions the cursor.
- Pressing a button on a mouse usually gives a command.

The Mouse and the Serial Port

The connector for the keyboard cable on the TI display unit and the built-in serial port on the system unit have some circuits in common. You cannot use a mouse while using an external device that sends signals to the built-in serial port. Among the external devices that can cause interference are external modems and, occasionally, serial printers.

To avoid interference between the external device and the mouse, you need to do one of the following.

- Disconnect the mouse before using the external device.
- Disconnect the external device before using the mouse.
- Connect the external device to a port different from the built-in serial port.

The Mouse and the Operating System

You can add a mouse device driver to some operating systems so that the operating system can interpret signals coming from the mouse. With a mouse device driver, you can use a mouse even though your application program is not specifically designed for one.

If you have a mouse device driver added to the operating system, and you later want to use an external device connected to the built-in serial port, you need to remove the mouse device driver. You do this by reloading the operating system without the device driver program.

The Mouse and Application Programs

Some application programs have their own mouse device driver. These programs interpret signals coming from the mouse directly.

If you have an application program with its own mouse device driver, and you want to use an external device connected to the built-in serial port, you can remove the mouse device driver simply by exiting the application program. Once the program is exited, the external device can be used. With some application programs, you can reconfigure the serial port while you use the application program. With these programs, you do not need to exit the program to use the external device.

What Is a Device Driver?

A device driver is a program that enhances the capabilities of an operating system. For example, a mouse device driver enables an operating system to interpret signals coming from the mouse. Other device drivers enable an operating system to do such things as use a portion of internal memory as if it were a drive or print the graphics portion of the screen on the printer.

Hardware Requirements of Application Programs

The following chart shows some of the hardware requirements of different types of application programs. Your application programs may have additional requirements from those in the chart.

Application	CRT Controller	Printer
Word Processing	Some programs can be modified to allow operation with either the TI or PC-AT Mode CRT Controller. Other programs work with only one kind of CRT controller, so you must have the correct CRT controller.	To be able to use such special features of the printer as underscore and boldface, the program must support those features. To print on envelopes or individual sheets, the printer may need a cut-sheet feeder.
Communications	Some communication equipment will only work with one kind of CRT controller.	

Mouse	Communication Equipment	Other Hardware
If the program uses a mouse, you may experience interference when using a printer connected to the built-in serial port. To avoid this interference, connect the printer to a different serial port.		
If using a modem connected to the built-in serial port, disconnect the mouse before running communication software.	Make sure the communication equipment is compatible with the communication software and computer with which you will be communicating.	If you have repeated problems while communicating, you may need a special telephone line.

Application	CRT Controller	Printer
Graphics, Computer-Assisted Design (CAD)	Programs can usually work with only one kind of CRT controller, so you must have the correct CRT controller installed.	Programs need a printer capable of printing graphics.
	The TI Mode CRT Controller has higher resolution and gives you more colors when using graphics than the PC-AT Mode CRT Controller.	To print graphics, you need a printer with graphics capabilities and that is compatible with the program.
Accounting and other Data Processing	Some programs require a specific CRT controller. Make sure programs match the CRT controller you are using.	To print reports, you may need a printer with a wide carriage. To print forms with multiple copies, you need an impact printer.

Mouse	Communication Equipment	Other Hardware
If programs use the TI Optical Mouse, you may experience interference when using a printer connected to the built-in serial port. To avoid this interference, connect the printer to a different serial port.		You may be able to buy a special graphics board that gives you very high resolution. These graphics boards usually require a special display unit. Some programs need a plotter.

Chapter 8: Approaches to Problem Solving

Service for the BUSINESS-PRO Computer is available from Texas Instruments and the place of purchase. Before you call for service, review this chapter to determine the nature of the problem, to see if you can solve it yourself, and to learn what information to have available when calling service.

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Resources for Solving Problems

When a problem occurs with your system, you have several resources available to determine the nature of the problem and possible solutions. The resource you need to consult depends on the type of problem you have and whether it was accompanied by an error message on the screen or not.

Chapter 9: Problems Without Error Messages

This chapter is organized into categories of common problems that do not produce error messages on the screen. Each category includes solutions for you to follow. For example, this chapter includes possible solutions if the screen is blank or the printer does not print.

Chapter 10: System Error Messages

A system error message is a message that contains a number. For example, System Error 0011 indicates the battery needs replacing. This chapter is organized numerically according to the numbers that appear with system error messages and provides possible solutions.

Software Manuals

When any message other than a system error message appears on the screen, the source of the message could be either the operating system or the application program you are using. Information about these messages is contained in the software manuals.

Diagnostics Diskette and User's Guide

The Diagnostics program diagnoses problems with your system. For example, the program can verify if the source of a problem is a defect in the hardware and not a problem with the software. The *Diagnostics User's Guide* describes how to use the Diagnostics program.

Service

Texas Instruments and the place you purchased the equipment from have many types of service agreements. If you have a service agreement, refer to it for more information.

You should have the following information available when you call your service representative.

- Any error messages you received, either system error messages or software error messages
- The results of the Diagnostics program, including any error codes
- The serial and model numbers of the defective equipment

Determining the Correct Resource

If No Error Message Appears

Some problems with the system unit, display unit, keyboard, printer, or other devices are not accompanied by error messages. Follow these steps when one of these problems occurs.

1. Look in Chapter 9, Problems Without Error Messages, for the symptoms that most closely describe your problem.
2. Follow the recommended solutions in the order they are presented.
3. If you cannot correct the problem, follow these steps.
   - Run the Diagnostics program.
   - Call your service representative with the information described on the previous page.

If an Error Message Appears

Many problems are accompanied by error messages that indicate the nature of the problem. Follow these steps when one of these problems occurs.

1. Determine the source of the error message and refer to the appropriate resource.
   - If the error message says System Error, refer to Chapter 10, System Error Messages.
   - For any other messages, refer to the manual for the appropriate software, either the operating system or the application program.
2. Follow the recommended solutions.
3. If you cannot correct the problem, follow these steps.
   - Run the Diagnostics program.
   - Call your service representative with the information described on the previous page.

Chapter 9: Problems Without Error Messages

This chapter contains information you can use to solve problems when no error message appears on the screen. In some cases, more than one solution is provided. If one solution does not correct the problem, try the next solution recommended.

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If the Screen Is Blank

ADDITIONAL SYMPTOM	The power indicators on the system unit and the display unit are not on.

The system is not receiving power because of a faulty power outlet or a loose connection.

1. Turn off the system unit.
2. Unplug the power cable for the system unit from the power outlet.
3. Use a lamp or other small appliance to ensure there is power at the power outlet.
4. Ensure the power cable for the system unit is securely connected to the back of the system unit and to the power outlet.
5. Turn on the system unit and check to see if the power indicators on both the system unit and display unit come on.

ADDITIONAL SYMPTOM	The power indicator on the system unit is on, but the power indicator on the display unit is off.

The display unit is not receiving power from the system unit because of a loose connection.

1. Turn off the system unit.
2. Ensure the power cable for the display unit is securely connected to the back of the display unit and the system unit.
3. Turn on the system unit and check to see if the power indicator on the display unit comes on.

ADDITIONAL SYMPTOM	The power indicators on both the system unit and the display unit are on.

The **BRIGHTNESS** control on the display unit needs to be adjusted.

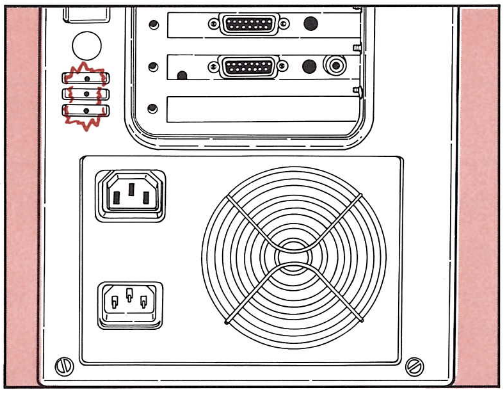
Turn the **BRIGHTNESS** control in a clockwise direction.

The data cable is loosely connected.

Ensure the data cable is securely connected to the connectors for the data cable on both the display unit and the CRT controller.

The system board inside the system unit is not operating properly.

Look through the vents in the back of the system unit to see if any lights are on, record the color of the lights, and have the system unit serviced.



The system unit contains two CRT controllers, and the data cable is attached to the TI Mode CRT Controller instead of the PC-AT Mode CRT Controller.

Reconnect the data cable to the PC-AT Mode CRT Controller.

If the Screen Image Is Below Standard

ADDITIONAL SYMPTOM	The information on the screen is dim.

The **BRIGHTNESS** control on the display unit needs to be adjusted.

Turn the **BRIGHTNESS** control in a clockwise direction.

ADDITIONAL SYMPTOM	It is hard to distinguish the character from the background.

The **CONTRAST** control needs to be adjusted.

The solution you need depends on the type of display unit you have.

- If you have a color display unit, have the display unit serviced.
- If you have a monochrome display unit, turn the **CONTRAST** control on the display unit in a clockwise direction.

ADDITIONAL SYMPTOM	The information on the screen is distorted.

Electrical interference is occurring at the power outlet.

1. Turn off the system unit.
2. Plug the power cable from the system unit into a power outlet that is on a different electrical circuit.
3. Turn on the system unit. If the problem no longer exists, you had electrical interference at the power outlet. If you must use the original power outlet, you can install a power-line conditioner that regulates electrical power to the system.

If Miscellaneous Screen Problems Occur

ADDITIONAL SYMPTOM	You cannot properly control the movement of the cursor on the screen.

The system is interpreting signals coming from the external device connected to the built-in serial connector as signals coming from the mouse.

The solution you need depends on which option you need to use.

- If you want to use the mouse, disconnect the external device connected to the built-in serial connector. You may also need to reconfigure the operating system for the mouse.
- If you want to use the external device, disconnect the mouse connected to the display unit. You may also need to reconfigure the operating system for the external device.

ADDITIONAL SYMPTOM	One character continues to repeat on the screen until the line or the screen is full.

The key for the character that is repeating on the screen is stuck.

Pull up the key; if the same key continues to stick, have the keyboard serviced.

If the Keyboard and Screen Characters Do Not Match

ADDITIONAL SYMPTOM	The characters displayed on the screen do not match the keys you pressed on the keyboard.

The version of the keyboard you have does not match the version you selected in the operating system.

Check your operating system manual for the procedure for selecting an international keyboard or an alternate keyboard.

The application program you are using is designed to produce some characters that are different from the characters on the keycaps.

Check the application program manual to see how the application program interprets the signals from the keyboard.

If Periodically Nothing Happens When You Press Keys

ADDITIONAL SYMPTOM	The power indicators on the display unit and the system unit are on.

The system is not operating properly due to power-line interference.

1. Turn off the system unit.
2. Plug the power cable from the system unit into a power outlet that is on a different electrical circuit.
3. Turn on the system unit and check to see if the system is working properly. If the problem no longer exists, you had power-line interference. You can install a power-line conditioner that regulates electrical power to the system.

ADDITIONAL SYMPTOM	The power indicators on the display unit and the system unit are on.

You are trying to use keys that only operate in the other mode.

Refer to pages 4-8 through 4-15 for information on key functions.

The security lock on the system unit is locked.

Turn the key in the security lock in a clockwise direction.

The keyboard is not working properly because of a loose connection.

Make sure the keyboard cable is securely connected to the connector for the keyboard cable on the display unit. Also make sure the data cable is securely connected to the connectors for the data cable on both the display unit and the CRT controller.

The application program is involved in a large processing task, such as sorting, and cannot respond to signals from the keyboard.

Wait a while; refer to the application program manual for how long.

The application program is defective.

1. Exit the program.
    - If the system is in TI mode, exit the program by holding down the **SHIFT** key while pressing the **BREAK/PAUSE** key.
    - If the system is in PC-AT mode, exit the program by holding down the **CTRL** key while pressing the **SCROLL LOCK** key.
2. Try running the application program again; if the program still does not work, contact the place of purchase.

The application program is defective.

1. Warmstart your system by pressing the **ALT** and **CTRL** keys while pressing the **DEL** key. If nothing happens, turn the system unit off and then on.
2. Make a new working copy of the program from the original diskette containing the application program.
3. Try running the application program again using the new working copy.

The application program you are using cannot run because it is not compatible with the CRT controller.

If you have only one CRT controller, either you need to buy an application program that is compatible with your CRT controller or buy a CRT controller that is compatible with your application program.

If you have two CRT controllers installed, follow these steps.

1. Turn off the system unit.
2. Wait 15 seconds before turning on the system unit again.
3. Select the other CRT controller by using an operating system command.
4. Try running the application program again.

The application program you are using cannot run because it does not work when the turbo operation is on.

1. Turn off the system unit.
2. Wait 15 seconds before turning on the system unit again.
3. Turn off the turbo operation by using an operating system command.
4. Try running the application program again.

If the Printer Does Not Print

ADDITIONAL SYMPTOM	The power indicator on the printer does not come on.

The printer is not receiving power because of a faulty power outlet or a loose connection.

1. Turn off the printer and system unit.
2. Unplug the power cable for the printer from the power outlet.
3. Use a lamp or other small appliance to ensure there is power at the power outlet.
4. Connect the power cable for the printer to the power outlet.
5. Ensure the printer data cable that connects the system unit to the printer is securely connected.
6. Turn on the printer and the system unit and make sure the power indicators on the printer and the system unit come on.

ADDITIONAL SYMPTOM	The printer power indicator is on, but the online indicator is off.

The printer is not online.

Press the online switch.

The printer is out of paper or ribbon.

Install more paper or a new ribbon.

The paper is jammed in the printer.

Remove the paper that is jammed in the printer and insert another sheet of paper.

ADDITIONAL SYMPTOM	The online indicator on the printer is on, but the printer is not printing.

The printer data cable is loosely connected.

Ensure the printer data cable is securely connected to the system unit and the printer.

The printer data cable is connected to the wrong connector on the system unit.

Ensure the printer data cable is connected to the correct connector on the system unit, either parallel or serial.

The operating system you are using is not configured for the printer.

For information on how to configure the operating system for the printer, refer to the operating system manual.

Internal switches in the printer are not set to work with your operating system.

For information on how to set the internal switches in the printer to work with the operating system, refer to the operating system manual and the printer manual.

If the Printer Prints Incorrect Characters

ADDITIONAL SYMPTOM	You are using a serial printer and all the characters your printer prints are wrong.

The operating system is set to send information to the printer at a speed (baud rate) that is different from the baud rate of the printer.

For information on how to set the operating system and printer to the same baud rate, refer to the operating system manual and the printer manual.

ADDITIONAL SYMPTOM	Occasionally, the printer prints characters different from those you expect.

The printer data cable is loosely connected.

Ensure the printer data cable is securely connected to the system unit and the printer.

The application program you are using is not configured to work with the printer.

For information on how to configure the application program to the printer, refer to the application program manual and the printer manual.

ADDITIONAL SYMPTOM	When communicating using a modem, you occasionally get wrong characters.

Interference on the telephone line is causing problems.

Wait a minute; call back and try communicating again.

The system is interpreting signals coming from the mouse as if the signals were coming from the external modem connected to the built-in serial connector.

Disconnect the mouse.

The serial interface, the modem, or the computer you are communicating with are not configured the same.

Determine what the proper communication configuration is and reconfigure the system.

If Your Program Runs Erratically

ADDITIONAL SYMPTOM	The turbo operation light is on.

The application program you are using cannot run because it does not work when the turbo operation is on.

1. Try to exit the application program in the normal way.
2. If you cannot exit the application program, press the **C** key while pressing the **CTRL** key.
3. If you still cannot exit the application program, warmstart your system by pressing the **ALT** and the **CTRL** keys while pressing the **DEL** key.
4. If you still cannot exit the application program, turn off the system unit.
5. Wait 15 seconds before turning on the system unit again.
6. Turn off the turbo operation by using an operating system command.
7. Try running the application program again.

Chapter 10: System Error Messages

If you have received a system error message, look it up in this chapter and follow the recommended actions listed. The system error messages that are numbered are listed in numerical order. The system error messages that are not numbered are grouped together at the end of the chapter.

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System Error Messages 10-1

System Error Messages

The system error messages are usually caused by problems with the hardware. This chapter is a table that lists the system error messages you can receive and the recommended action for each error message. If the problem still persists after you perform the recommended action, have the equipment serviced.

Error Messages	Recommended Action
System Error - 0001 Error in 8254 timer on system board	1. Turn the system unit off and then on. 2. Have the system board serviced.
System Error - 0002 CRC error in ROM on system board	1. Turn the system unit off and then on. 2. Have the system board serviced.
System Error - 0003 Error in CMOS RAM on system board	1. Turn the system unit off and then on. 2. Have the system board serviced.
System Error - 0004 Memory refresh error on system board	1. Turn the system unit off and then on. 2. Have the system board serviced.
System Error - 0005 Error in lower 256K RAM on system board	1. Turn the system unit off and then on. 2. Have the system board serviced.
System Error - 0006 Turbo mode error on system	1. Turn the system unit off and then on. 2. Have the system board serviced.

Error Messages	Recommended Action
System Error - 0007 Register error in 8259 on system board	1. Turn the system unit off and then on. 2. Have the system board serviced.
System Error - 0008 Parity error in lower 256K RAM	1. Turn the system unit off and then on. 2. Have the system board serviced.
System Error - 0010 Checksum error in ROM in option board	1. Run the diagnostics to determine which option board is defective. 2. Have the defective board serviced.
System Error - 0011 CMOS battery is dead	Have the CMOS battery replaced.
System Error - 0012 No interrupt from 8254 timer	1. Turn the system unit off and then on. 2. Have the system board serviced.
System Error - 0013 Color mode error in CRT controller	1. Turn the system unit off and then on. 2. Run the diagnostics. 3. Have the CRT controller serviced.

Error Messages	**Recommended Action**
System Error - 0014 Mono mode error in CRT controller	1. Turn the system unit off and then on. 2. Run the diagnostics. 3. Have the CRT controller serviced.
System Error - 0015 Error in TI Mode CRT Controller	1. Turn the system unit off and then on. 2. Run the diagnostics. 3. Have the TI Mode CRT Controller serviced.
System Error - 0020 Protected mode error in 80286 CPU	1. Turn the system unit off and then on. 2. Have the system board serviced.
System Error - 0021 Parity error at location xxxxxx	1. Turn the system unit off and then on. 2. Run the diagnostics to determine which memory option is defective. 3. Replace the defective memory. 4. If necessary, reconfigure the system using the Start-Up program.

Error Messages	Recommended Action
System Error - 0022 Error in memory address lines 18-23	1. Turn the system unit off and then on. 2. Run the diagnostics to determine the source of the error. 3. Replace the memory board, system board, bus board, or other appropriate board.
System Error - 0030 Error in 8253 timer on system board	1. Turn the system unit off and then on. 2. Run the diagnostics. 3. Have the system board serviced.
System Error - 0031 Register error in 8259 on system board	1. Turn the system unit off and then on. 2. Run the diagnostics. 3. Have the system board serviced.
System Error - 0032 No interrupt from 8253 timer	1. Turn the system unit off and then on. 2. Run the diagnostics. 3. Have the system board serviced.
System Error - 0040 Error in 8042 processor on system board	1. Turn the system unit off and then on. 2. Run the diagnostics. 3. Have the system board serviced.

Error Messages	Recommended Action
System Error - 0041 Error in keyboard	1. Turn the system unit off and then on. 2. Run the diagnostics. 3. Have the keyboard serviced.
System Error - 0042 Error in keyboard interface	1. Turn the system unit off and then on. 2. Run the diagnostics. 3. Have the defective equipment serviced.
System Error - 0043 No interrupt from keyboard	1. Turn the system unit off and then on. 2. Have the defective equipment serviced.
System Error - 0050 Error in Winchester controller	1. Turn the system unit off and then on. 2. Run the diagnostics. 3. Have the Winchester controller serviced.
System Error - 0051 Error in DMA controller on system board	1. Turn the system unit off and then on. 2. Run the diagnostics. 3. Have the system board serviced.

Error Messages	Recommended Action
System Error - 0052 Error initializing disk n	1. Turn the system unit off and then on. 2. Run the diagnostics. 3. Have the Winchester controller serviced.
System Error - 0053 Error in RTC alarm interrupt	1. Turn the system unit off and then on. 2. Run the diagnostics. 3. Have the system board serviced.
System Error - 0054 Error in RTC periodic interrupt	1. Turn the system unit off and then on. 2. Run the diagnostics. 3. Have the system board serviced.
System Error - 0055 Error updating real time clock	1. Turn the system unit off and then on. 2. Run the diagnostics. 3. Have the system board serviced.
System Error - 0056 Error reading timer 2 from port 61h	1. Turn the system unit off and then on. 2. Run the diagnostics. 3. Have the system board serviced.

Error Messages	Recommended Action
System Error - 0060 Invalid opcode at location xxxx: yyyy	1. Turn the system unit off and then on. 2. Run the diagnostics. 3. Have the defective equipment serviced.
System Error - 0061 Parity error at location nn - m	1. Turn the system unit off and then on. 2. Run the diagnostics. 3. Have the defective memory serviced.
System Error - 0062 Parity error in expansion RAM	1. Turn the system unit off and then on. 2. Run the diagnostics. 3. Have the defective memory serviced.
System Error - 0063 Spurious hardware interrupt Reboot or Ignore?	1. Type the letter R. This causes the system to reboot. 2. Continue to use the system. If the error occurs again, run the diagnostics. 3. Have the defective equipment serviced.
System Error - 0064 Spurious software interrupt Reboot or Ignore?	1. Type the letter R. This causes the system to reboot. 2. Continue to use the system. If the error occurs again, consult the software manual.

Error Messages	**Recommended Action**
System configuration is not set Run Start-Up on Diagnostics diskette Press the space bar to continue	1. Insert the Diagnostics diskette into the first floppy drive. 2. Press the space bar. 3. Set the system configuration using the Start-Up program.
Memory configuration is not set Run Start-Up on Diagnostics diskette	1. Insert the Diagnostics diskette into the first floppy drive. 2. Press the space bar. 3. Set the memory configuration using the Start-Up program.
Time/date setting is invalid Run Start-Up on Diagnostics diskette	1. Insert the Diagnostics diskette into the first floppy drive. 2. Press the space bar. 3. Set the time and date using the Start-Up program.
Memory overlap at location xxxxxx	1. Run the diagnostics. 2. Reset the low and high addresses for the memory that overlaps.
Error attempting to boot system Insert system disk	1. Insert an operating system diskette into a floppy drive. 2. Press the space bar to continue.

Error Messages	**Recommended Action**
System unit is key-locked Unlock system unit	1. Insert the system unit key. 2. Turn the key clockwise to unlock the system unit.
Press the space bar to continue	Press the space bar when you are ready to continue.
Press **ESC** key to override boot device	If you want to boot from the first floppy drive, press the **ESC** key within approximately five seconds. If you do not press the **ESC** key within five seconds, the system will first try to boot from the drive specified in the Start-Up program.
RAM test in progress	Wait until the RAM test is finished. This message is erased when the RAM test is finished.
Reboot or Ignore?	The system has detected an error. You have the choice of ignoring the error or rebooting the system. Even though you will lose all the data stored in RAM, you should usually reboot if you get this message.

Chapter 11: Maintenance

Your BUSINESS-PRO Computer requires little maintenance. To help ensure continued, trouble-free operation, follow the guidelines described in this chapter.

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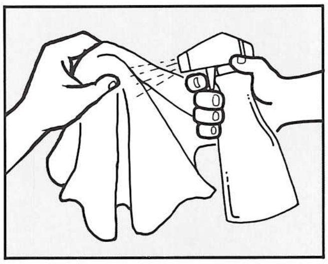
Cleaning the System

The exterior surface of the system components should be cleaned only when needed. You should clean the floppy drives and tape backup on a regular maintenance schedule. Some external options, such as a mouse or a printer, require special cleaning. For instructions, refer to the option manual.

Cleaning the Exterior of Components

To remove dust, smudges, and fingerprints from the surface of system components, use the following procedure.

1. Dampen a soft cloth with a mild detergent. If using a spray cleaner, spray the cleaner directly on the cloth and not on the system component.



2. Wipe the surface clean.

Cleaning Drives

Floppy drives and tape backups require periodic cleaning. Winchester drives, which contain sealed media, require no cleaning.

To clean floppy drives, you need to:

- Purchase a dry head-cleaning product designed for cleaning double-sided drive heads.
- Clean floppy drives after every 1000 hours of use (approximately every six months).

To clean tape backups, refer to the tape backup manual for cleaning instructions.

Obtaining a New Key for the Security Lock

Your system comes with two keys to the security lock, which is on the front of the system unit. The information below explains how to replace keys if you lose them.

Duplicating a Key

If you want to make a copy of the key for the security lock, take the key to your local locksmith. If your locksmith cannot duplicate the key, you can obtain the name of the nearest locksmith that can using the information below.

Medeco Security Locks, Inc.
P.O. Box 1075
Salem, VA 24153
(703) 387-0481

Replacing Lost Keys

If you have lost both keys to your security lock, follow the procedure below.

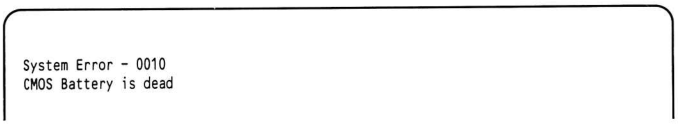
1. Locate the key number. The key number is on a tag that was originally packed with the keys. This number should have been recorded during system installation.
2. Contact your local locksmith to see if the locksmith can replace the key from the key number.
3. If the locksmith cannot replace the key, use the information above to contact Medeco Security Locks, Inc. for the name of the nearest locksmith that can.

Replacing the Batteries

While the system is off, four batteries maintain essential information about the system, such as the information you entered in the Start-Up program. These batteries which are located underneath the system unit front panel are AA-sized alkaline batteries and can be purchased at many retail stores.

Determining When to Replace the Batteries

When you turn on the system, the self-test checks the batteries. If the batteries are dead, you see the following message.



```
System Error - 0010
CMOS Battery is dead
```

You can use the system even if the batteries are dead; however, you must run the Start-Up program on the Diagnostics diskette each time you turn on the system.

Disconnecting Power

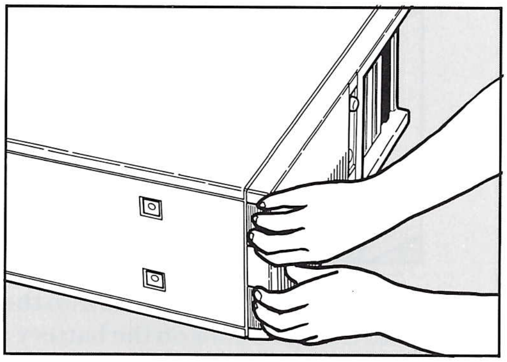
Follow these steps to disconnect power to the system.

1. Turn off all external devices.
2. Turn off the system unit.
3. Unplug the power cable for the system unit from the power outlet.

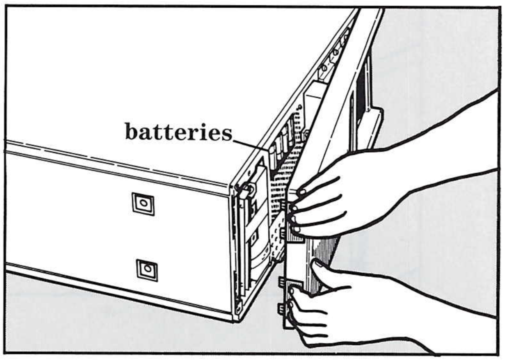
Locating the Batteries

The batteries are located underneath the front panel. To remove the front panel, the security lock must be in the unlocked position. Follow these steps to locate batteries.

1. Press in firmly on the notched areas at the bottom end of the front panel.



2. Swing the front panel out and away to remove it from the system unit.



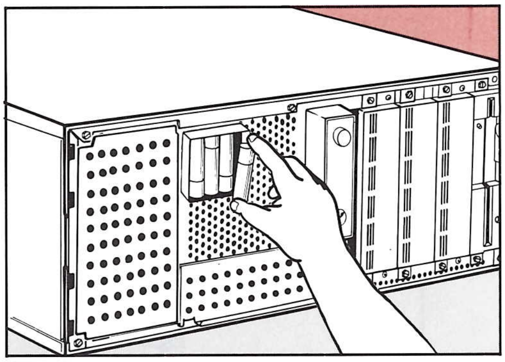
3. Set the front panel aside.

You replace the batteries in your system just like you do any other battery-operated device. However, you need to run the Start-Up program after the system is reassembled.

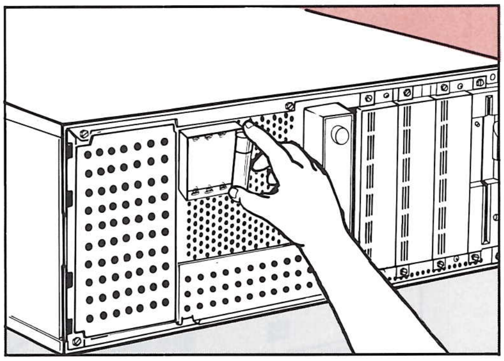
Installing the New Batteries

Follow these steps to install the new batteries.

1. Remove all four batteries from the plastic holder on the front wall of the system unit.



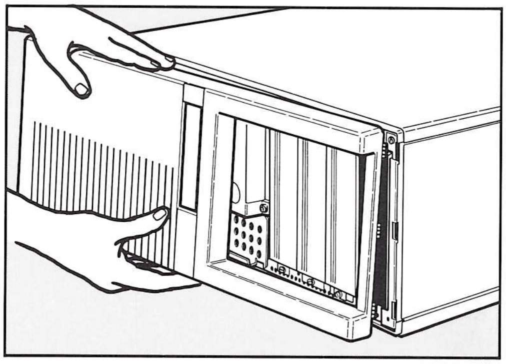
2. Insert the new batteries into the system unit. Refer to the directions on the battery pack to make sure you install the batteries correctly.



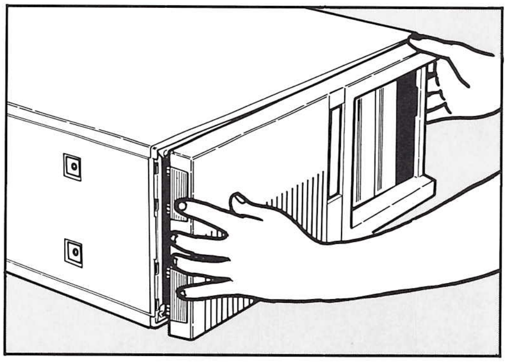
Reassembling the System

To reinstall the front panel, follow these steps.

1. Hook the tabs on the front panel into the openings in the system unit.



2. Hold the attached end in place while you swing the front panel closed and snap it into place.



3. Plug the power cord for the system unit into a power outlet and turn on the system.
4. Run the Start-Up program on the Diagnostics diskette.

Chapter 12: Moving and Storing

Guidelines for moving and storing your system are provided in this chapter. The type of move you are making determines the specific steps you should follow when disassembling and packing your system.

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Preparing for All Types of Moves 12-4
Moving a Short Distance 12-6
Moving a Long Distance 12-7
Packing for Long-Distance Moves 12-8
Storing the System 12-12
Reconnecting the System 12-13

Planning a Move

The first step in planning to move the system is to decide whether you are making a short-distance move, a long-distance move, or a move to a storage area. If you are moving your system to another country, you need to be aware of some special considerations.

Types of Moves

The type of move you are making determines the steps you need to follow when disassembling and moving your system. The three types of moves are as follows.

- Short-distance moves — moves within a building from one desk to another; does not require packing the system
- Long-distance moves — moves to a different building; requires packing the system
- Moves to a storage area — moves that do not require immediate reassembly; requires packing the system

Considerations for Moving to Another Country

In addition to packing requirements, you need to be aware of the following special considerations when moving your system to another country.

- Regulations set by the U.S. Customs Agency
- Regulations for use of communication equipment in the country to which you are moving
- Standard voltage available in the country to which you are moving

U.S. Customs Regulations

The U.S. Customs Agency has restrictions on the export of computer equipment to some countries. Check with the U.S. Customs Agency to see if any of these restrictions apply to you.

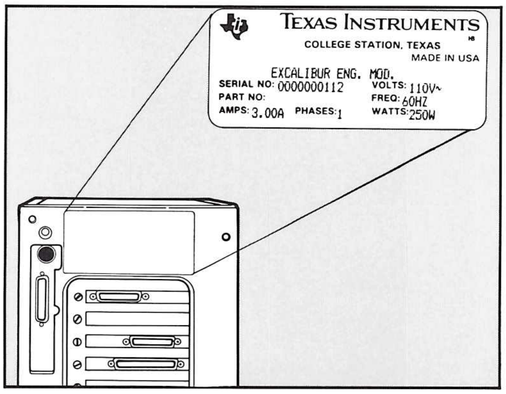
Communication Equipment

Some countries restrict the communication equipment you can connect to telephone lines. Before using an internal modem, external modem, or other communication equipment, check with the national telephone company in the country to which you are moving.

Voltage Requirements

The standard voltage available varies from country to country. For example, in the United States, the standard voltage is 110 volts; in most European countries, the standard voltage is 220 volts. Make sure the voltage available to your system unit matches the label on the rear of your system unit.

External devices also must match the voltage available and usually have labels indicating voltage requirements. A TI display unit, for example, shows voltage requirements on the back.



If the voltage available does not match the voltage requirements of your system, you can plug your system into a voltage converter.

Preparing for All Types of Moves

Some preparations are necessary for all types of moves. These include preparing the drives and disconnecting power from all system components.

Preparing the Winchester Drive

Follow these steps to prepare each Winchester drive for moving.

1. Back up each Winchester drive on floppy diskettes or tape cartridges.
2. Prepare each Winchester drive for moving by using the appropriate shipping command in your operating system.

Preparing the Floppy Drive

Follow these steps to prepare each floppy drive for moving.

1. Remove all floppy diskettes from the floppy drives.
2. Insert the cardboard card that came with the floppy drive.

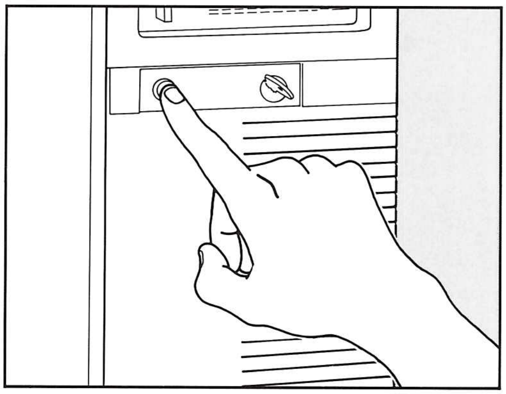
Preparing the Tape Backup

To prepare the tape backup for moving, remove the tape cartridge.

Disconnecting Power

Follow these steps to disconnect power from all system components.

1. Lock the security lock on the system unit and store the key in a safe place.
2. Turn off all external devices.
3. Turn off the system unit.



4. Unplug the power cable for the system unit from the power outlet.
5. Unplug the power cables for all external devices from the power outlets.

Moving a Short Distance

Moving to another desk in the same building does not require packing; however, you need to use care when handling each system component, especially a system unit containing a Winchester drive.

Procedure

Follow these steps when you are moving your system a short distance.

1. Label each cable indicating where it connects to the back of the system unit.
2. Disconnect cables from the system unit.
3. Move one component at a time. Heavy pieces, such as the system unit, may require two people.
4. For information about reconnecting the system, refer to page 12-13 in this manual.

Moving a Long Distance

When moving your system to another building, pack your system properly. The same procedure applies whether you are moving across town or to another country.

Procedure

Follow these steps when moving your system a long distance.

1. Locate the original packing materials that came with each system component.
2. Label each cable indicating where it connects to the back of the system unit.
3. Disconnect cables from the system unit and from the external devices.
4. Coil each cable and place it with the proper system component.
5. Go to the next page for detailed instructions on packing the parts of your system for long-distance moves.

Packing for Long-Distance Moves

It is very important when making long-distance moves that you protect your system from damage by packing properly.

Special Packing Materials

When shipping your system, use the original packing materials to protect the system components. In addition, wooden crates (which give additional protection against rough handling) can be used.

Packing Software and Documentation

Moving your system also includes moving programs, data, and the hardware and software documentation. Use the following guidelines to ensure that software and documentation arrive safely.

- If you cannot carry floppy diskettes and tape cartridges with you, enclose them in a plastic bag before packing them.
- Always ship backup copies separately from originals.
- Pack the hardware documentation with each option so that the instructions are available at installation.

Packing Options

The packing requirements for optional devices depend on the type of option.

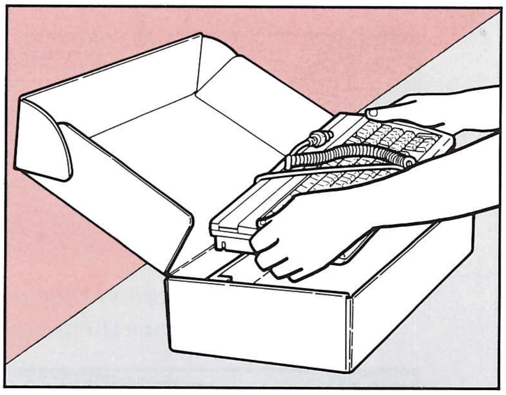
Leave internal options in the system unit. You may want to ship the original packing material for internal options with your shipment.

External options, such as the printer and the display unit, should be packed in the original packing material or in a manner that offers equivalent protection.

Packing the Keyboard

Follow these steps to prepare the keyboard for a long-distance move.

1. Place the keyboard in the original keyboard carton.



2. Place the original packing material on top of the keyboard and seal the carton.

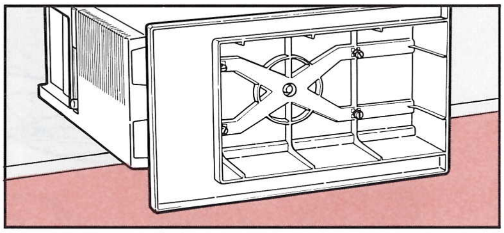
Packing for Long-Distance Moves (Continued)

After preparing the drives for moving and packing the keyboard, you are ready to pack the system unit. Internal options can remain in the system unit. If the system unit stand is connected, you need to remove it before packing the system unit.

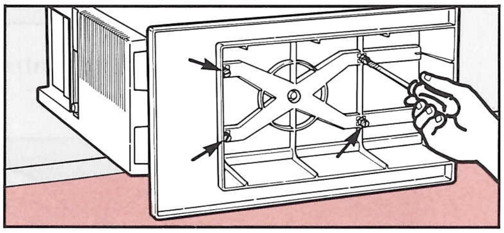
Removing the Stand

Follow these steps to remove the stand from the system unit.

1. Place the system unit on a desk so the stand hangs over the edge.



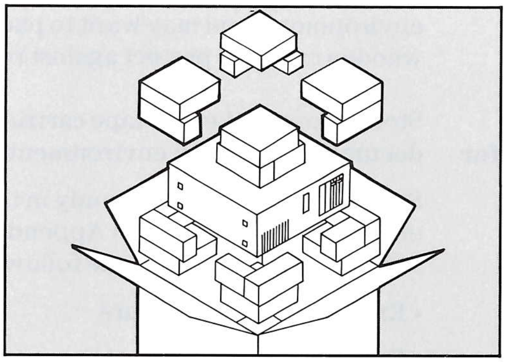
2. Remove the four screws that attach the stand to the system unit and place them in a plastic bag.



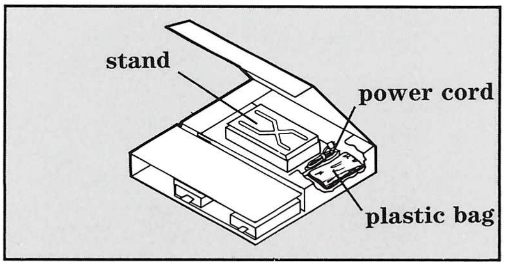
Packing the System Unit and the Stand

Follow these steps to pack the system unit and stand.

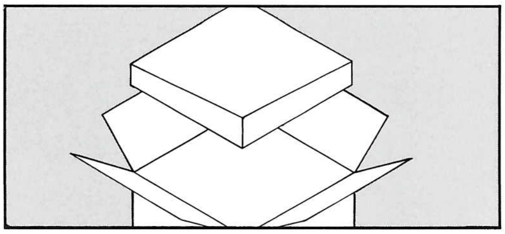
1. Place the system unit in the original packing material.



2. Place the stand, the plastic bag containing the screws, and the system unit power cord in the cardboard tray they originally came in.



3. Place the tray on top of the system unit and seal the carton.



Storing the System

If you are moving the system to a storage area, you need to follow the packing instructions for a long-distance move. Depending on the storage environment, you may want to take additional precautions when packing.

Packing for Storage

Pack your system according to the packing instructions for a long-distance move on pages 12-8 through 12-11 of this manual.

If you are storing the system in a nonoffice environment, you may want to pack the cartons in wooden crates to protect against rough handling.

Selecting an Environment for Storage

Store floppy diskettes, tape cartridges, and documentation in an environment typical of an office.

Store system components only in the storage environment described in Appendix I. Make sure the storage area is free from the following.

- Extremes of temperature
- Excess humidity
- Dust and chemical vapors

Reconnecting the System

It is important to follow the proper installation procedure when connecting your system at the new location. If you have moved to another country, you must make sure the voltage requirements of your system components match the voltage available in that country.

Using the *Installation Guide*

Locate the carton containing the *Installation Guide* for your system. Refer to this guide for information on the following.

- Planning the work area
- Connecting external devices

⚡ CAUTION

Operating at the wrong voltage can destroy system components.

Make sure the voltage requirements from the system unit and other external devices match the voltage available. The voltage requirements of most of the system components are on a label attached to the system component.

Appendixes

These appendixes contain additional information about your keyboard, as well as the operating requirements and specifications for the BUSINESS-PRO Computer.

Appendix A:	Effect of TI Mode on the Keyboard	2
Appendix B:	Effect of PC-AT Mode on the Keyboard	4
Appendix C:	Control Codes, Characters, and the ALT Key	6
Appendix D:	Control Codes and the CTRL Key	10
Appendix E:	International Keyboards	12
Appendix F:	International Keyboards and the ALT Key	14
Appendix G:	Replacing Keyboard Tiles and Keys	17
Appendix H:	Operating Requirements	21
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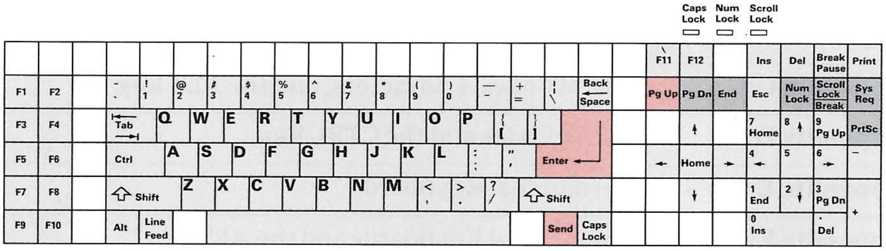
Appendix A: Effect of TI Mode on the Keyboard

When the system is in TI mode, the keys on the keyboard operate similarly to a keyboard on a Texas Instruments Professional Computer (TIPC) with a few exceptions. The exceptions are explained below.

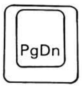


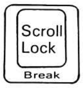
▨ **Keys that have no function**

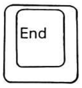
🟥 **Keys that are similar to TIPC keys but different**

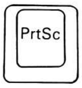
☐ **Keys that are the same as TIPC keys**

The following keys have no corresponding keys on the TIPC keyboard. Pressing these keys has no effect.

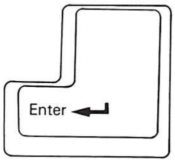




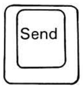




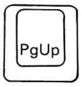
The following keys either function similarly to different keys on the TIPC keyboard or function in a different way.



Functions the same as the **RETURN** key on a TIPC keyboard; if you are using software for the TIPC, press this key when you are instructed by your software or software manual to press the **RETURN** key



Functions the same as the **ENTER** key on a TIPC keyboard; if you are using software for the TIPC, press this key when you are instructed by your software or software manual to press the **ENTER** key

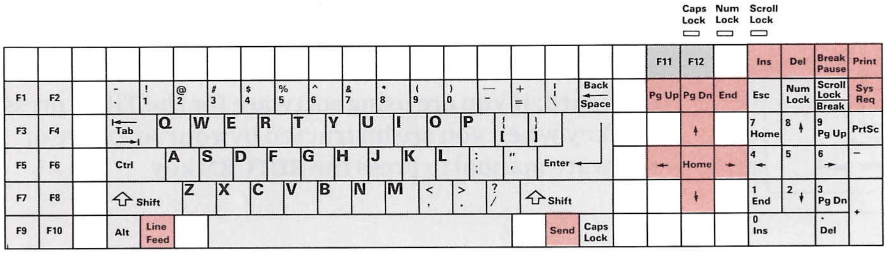


Functions the same as the **ESC** key on a TIPC keyboard

All other keys on the keyboard function just like keys on the TIPC keyboard.

Appendix B: Effect of PC-AT Mode on the Keyboard

When the system is in PC-AT mode, the keys on the keyboard operate similarly to the keys on a PC AT with a few additions. If you are accustomed to an IBM Personal Computer, you also need to read the material below because some keys on the BUSINESS-PRO Computer are not available on the IBM Personal Computer.

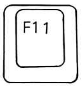


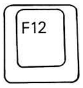
▨ **Keys that have no effect**

🟥 **Keys that are similar to PC AT keys but different**

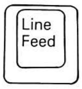
☐ **Keys that are the same as PC AT keys**

The following keys have no corresponding keys on the PC AT keyboard. Pressing these keys produces no effect.

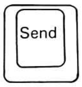




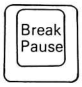
The following keys either function similarly to different keys on the PC AT keyboard or function in a different way.



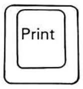
Produces the same effect as pressing and holding the **CTRL** key while pressing the **J** key



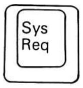
Does the same thing as the **ENTER** key



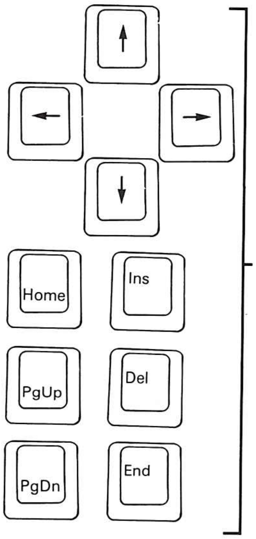
Produces the same effect as pressing and holding the **CTRL** key while pressing the **NUM LOCK** key



Produces the same effect as pressing and holding the **CTRL** key while pressing the **PRTSC** key



Functions the same as the **SYS REQ** key on the PC AT; depends on software



Duplicate the command keys on the numeric keypad and operate in the same way; however, when these keys are pressed with the **CTRL** keys, they do not function.

All other keys on the keyboard function just like keys on the PC AT keyboard.

Appendix C: Control Codes, Characters, and the ALT Key

This appendix describes how to use the ALT key to produce any of the 256 characters in the character set for the BUSINESS-PRO Computer. This character set varies slightly depending on whether you are using TI mode or PC-AT mode.

Character Sets

A character set consists of all of the control codes and characters used by your system, including letters, numbers, symbols, and special characters. The BUSINESS-PRO Computer has 256 characters in the character set. Each character has a corresponding numeric code.

- The codes from 0 to 127 represent the control codes and characters of the American Standard Code for Information Interchange (ASCII), which is a standard for systems.
- The codes from 128 to 255 represent the extended character set, which can vary from system to system.

The Effect of Mode on the Character Set

Your system has two available character sets — one for TI mode and one for PC-AT mode. The two character sets are identical except for the following two characters.

TI Mode		PC-AT Mode	
166	167	166	167
Ø	¤	ª	º

Using the ALT Key

To produce control codes or a character not available on your keyboard, follow these steps.

1. Using the chart on the next page, locate the control code or character you want to produce.
2. Note its three-digit number. (When you are ready to enter the number, make sure you enter all three digits, including any zeros.)
3. While holding down the **ALT** key, type the three digits in the number. You must type the numbers using the numeric keypad and not the other number keys. (In TI mode, the character appears on the screen when the last number key is pressed. In IBM mode, the character appears on the screen after you release the **ALT** key.)

Example

If you want to display the division sign (÷), follow these steps.

1. Find the division sign in the chart on the next page.
2. Note the three-digit number is 246.
3. While holding down the **ALT** key, use the numeric keypad to type 246. (In TI mode, the division sign appears on the screen when the **6** key is pressed. In IBM mode, the division sign appears on the screen after you release the **ALT** key.)

Some codes may not cause a character to appear on the screen. For example, holding down the **ALT** key and typing 013 is the same as pressing the **RETURN** key, which does not display a character.

Appendix C: Control Codes, Characters, and the ALT Key (Continued)

The following chart shows the character set for the BUSINESS-PRO Computer in TI mode. ASCII control codes in the chart are represented by their abbreviations.

Character Set Chart

000	001	002	003	004	005	006	007	008	009	010	011	012	013	014	015	016	017	018	019
NUL	SOH	STX	ETX	EOT	ENQ	ACK	BEL	BS	HT	LF	VT	FF	CR	SO	SI	DLE	DC1	DC2	DC3
020	021	022	023	024	025	026	027	028	029	030	031	032	033	034	035	036	037	038	039
DC4	NAK	SYN	ETB	CAN	EM	SUB	ESC	FS	GS	RS	US	SP	!	"	#	$	%	&	’
040	041	042	043	044	045	046	047	048	049	050	051	052	053	054	055	056	057	058	059
(	)	*	+	,	—	.	/	0	1	2	3	4	5	6	7	8	9	:	;
060	061	062	063	064	065	066	067	068	069	070	071	072	073	074	075	076	077	078	079
<	=	>	?	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
080	081	082	083	084	085	086	087	088	089	090	091	092	093	094	095	096	097	098	099
P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_	‘	a	b	c
100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119
d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w

Character Set Chart (Continued)

120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139
x	y	z	{	¦	}	~	DEL	Ç	ü	é	â	ä	à	å	ç	ê	ë	è	ï
140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159
î	ì	Ä	Å	É	æ	Æ	ô	ö	ò	û	ù	ÿ	Ö	Ü	¢	£	¥	₧	ƒ
160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179
á	í	ó	ú	ñ	Ñ	Ø	¤	¿	⌐	¬	½	¼	¡	«	»	░	▒	▓	│
180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199
┤	╡	╢	╖	╕	╣	║	╗	╝	╜	╛	┐	└	┴	┬	├	─	┼	╞	╟
200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219
╚	╔	╩	╦	╠	═	╬	╧	╨	╤	╥	╙	╘	╒	╓	╫	╪	┘	┌	█
220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239
▄	▌	▐	▀	α	β	Γ	π	Σ	σ	µ	τ	Φ	Θ	Ω	δ	∞	ø	∈	∩
240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255				
≡	±	≥	≤	⌠	⌡	÷	≈	°	▪	-	√	ⁿ	²	■	SP				

Appendix D: Control Codes and the CTRL Key

The ASCII control codes can be produced by pressing the CTRL key in combination with other keys. The chart lists the keys that produce control codes depending on your type of keyboard and the mode your system is in. (These control codes can also be produced using the ALT-key method in Appendix C.)

Using the CTRL Key

Because you may find references to control codes by number or by abbreviation, both forms are listed in the left column of the chart. To produce a control code, follow these steps.

1. Scan the left column to locate the control code you need.
2. Read across the page to find the specific key on your keyboard that is used with the **CTRL** key.
3. While holding down the **CTRL** key, press the key that produces the desired control code. (If the key is a number key, press a number key at the top of the keyboard. You cannot produce control codes using the numeric keypad on the right side of the keyboard.)

Example

To insert a BEL control code into a file if you are in TI mode and have a French keyboard, follow these steps.

1. Scan the left column to locate the abbreviation BEL.
2. Read across the page to the column for French keyboards in TI mode and note that the combination of keys needed is **CTRL G**.
3. While holding down the **CTRL** key, press **G**.

Chart of Control Codes

	ASCII Control Codes	PC-AT MODE All Languages	TI MODE United States, United Kingdom	TI MODE French, German, Italian, Spanish
1	(SOH)	CTRL A	CTRL A	CTRL A
2	(STX)	CTRL B	CTRL B	CTRL B
3	(ETX)	CTRL C	CTRL C	CTRL C
4	(EOT)	CTRL D	CTRL D	CTRL D
5	(ENQ)	CTRL E	CTRL E	CTRL E
6	(ACK)	CTRL F	CTRL F	CTRL F
7	(BEL)	CTRL G	CTRL G	CTRL G
8	(BS)	CTRL H	CTRL H	CTRL H
9	(HT)	CTRL I	CTRL I	CTRL I
10	(LF)	CTRL J	CTRL J	CTRL J
11	(VT)	CTRL K	CTRL K	CTRL K
12	(FF)	CTRL L	CTRL L	CTRL L
13	(CR)	CTRL M	CTRL M	CTRL M
14	(SO)	CTRL N	CTRL N	CTRL N
15	(SI)	CTRL O	CTRL O	CTRL O
16	(DLE)	CTRL P	CTRL P	CTRL P
17	(DC1)	CTRL Q	CTRL Q	CTRL Q
18	(DC2)	CTRL R	CTRL R	CTRL R
19	(DC3)	CTRL S	CTRL S	CTRL S
20	(DC4)	CTRL T	CTRL T	CTRL T
21	(NAK)	CTRL U	CTRL U	CTRL U
22	(SYN)	CTRL V	CTRL V	CTRL V
23	(ETB)	CTRL W	CTRL W	CTRL W
24	(CAN)	CTRL X	CTRL X	CTRL X
25	(EM)	CTRL Y	CTRL Y	CTRL Y
26	(SUB)	CTRL Z	CTRL Z	CTRL Z
27	(ESC)	CTRL [	CTRL [	CTRL 6
28	(FS)	CTRL \	CTRL \	CTRL 7
29	(GS)	CTRL]	CTRL]	CTRL 8
30	(RS)	CTRL 6	CTRL 6	CTRL 9
31	(US)	CTRL -	CTRL -	CTRL 10
127	(DEL)	CTRL BACKSPACE	CTRL BACKSPACE	CTRL BACKSPACE

Appendix E: International Keyboards

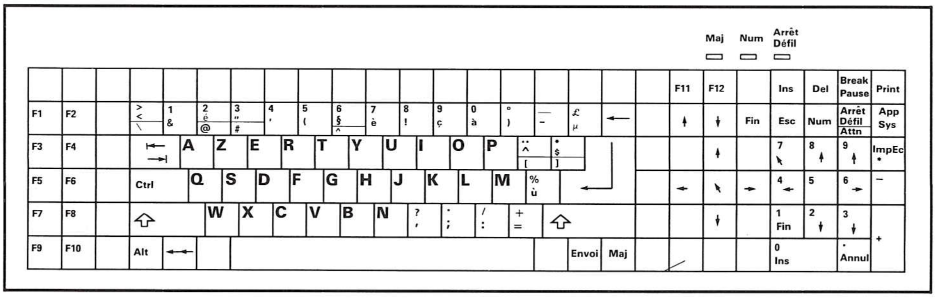
Different keyboards for the BUSINESS-PRO Computer are available for several languages. You must select the international version of the keyboard you are using in your operating system.

Identifying Your Keyboard

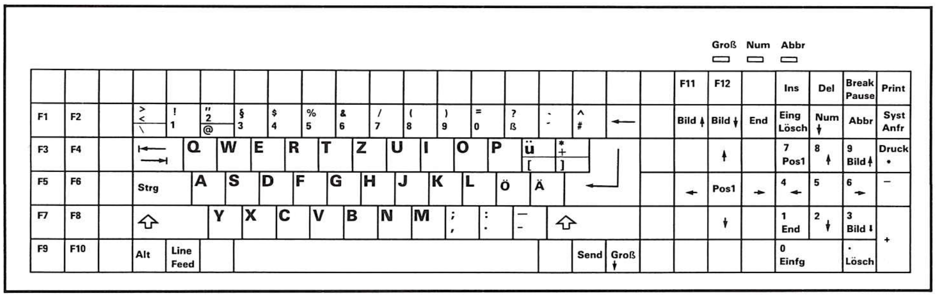
Keyboards are available for different languages other than English.

- French
- German
- Italian
- Spanish
- British English

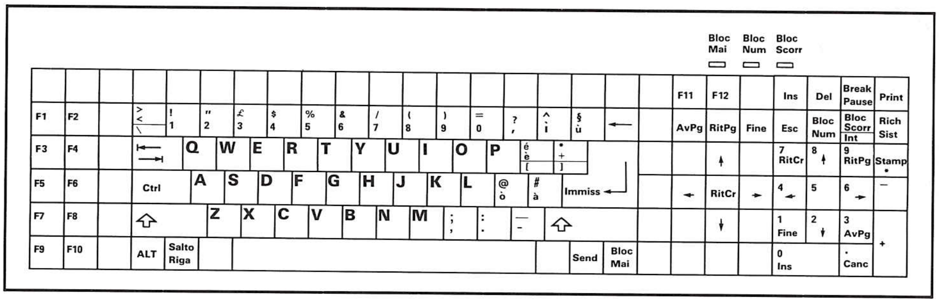
French


Maj Num Arrêt Défil
F11 F12 Ins Del Break Pause Print
F1 F2 > < \ 1 & 2 é @ 3 " # 4 ' 5 (6 § ^ 7 è 8 ! 9 ç 0 à °) — - £ µ ← Fin Esc Num Arrêt Défil Attn App Sys
F3 F4 A Z E R T Y U I O P ¨ ^ [$ *] 7 8 9 ImpEc
F5 F6 Ctrl Q S D F G H J K L M % ù 4 5 6 −
F7 F8 W X C V B N ? , . ; / : + = 1 Fin 2 3 +
F9 F10 Alt Envoi Maj 0 Ins . Annul

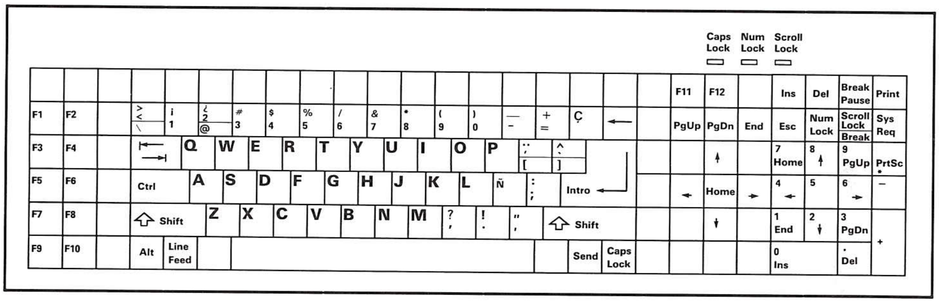
German


Groß Num Abbr
F11 F12 Ins Del Break Pause Print
F1 F2 > < \ ! 1 " 2 @ § 3 $ 4 % 5 & 6 / 7 (8) 9 = 0 ? ß ` ' ^ # ← Bild Bild End Eing Lösch Num Abbr Syst Anfr
F3 F4 Q W E R T Z U I O P ü [* +] 7 Pos1 8 9 Bild Druck
F5 F6 Strg A S D F G H J K L ö Ä Pos1 4 5 6 −
F7 F8 Y X C V B N M ; , : . — - 1 End 2 3 Bild +
F9 F10 Alt Line Feed Send Groß 0 Einfg . Lösch

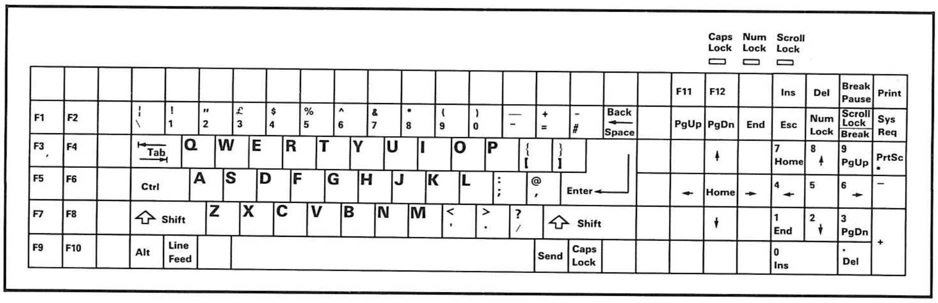
Italian



Spanish



British English



Appendix F: International Keyboards and the ALT Key

Some characters that are necessary for different languages but do not appear on keycaps can be produced by pressing the ALT key in conjunction with another key on the keyboard. This appendix explains the procedure and provides quick-reference charts.

How To Produce Additional Characters

To produce additional characters, follow these steps.

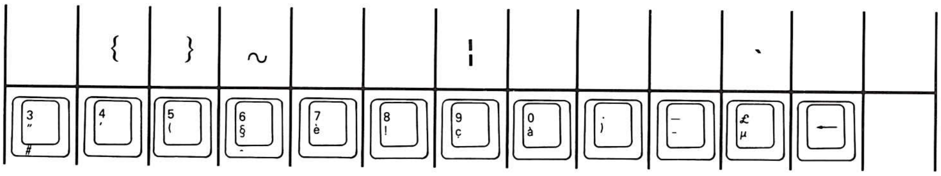
1. Locate the character you want on the top row of the appropriate chart on the next pages.
2. Press and hold the **ALT** key.
3. Press the key directly below the character that you want.

Example

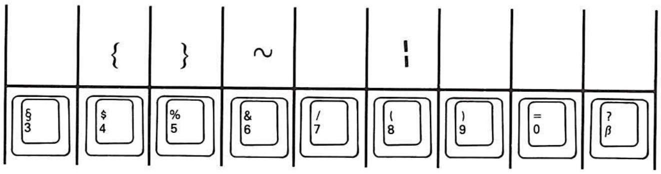
To produce the { character, press the **ALT** key in combination with:

- The **4** / **'** key on the French and German keyboards.
- The **&** / **7** key on the Spanish keyboard.
- The **.** / **3** key on the Italian keyboard.

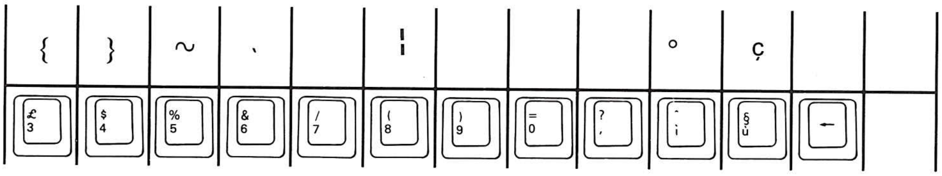
French



German



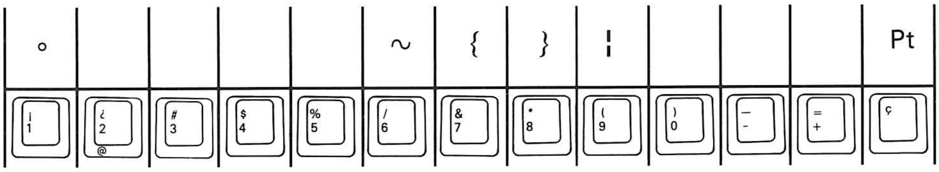
Italian



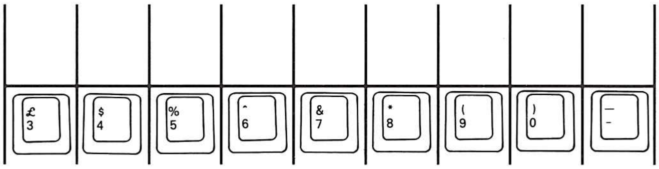
Appendix F: International Keyboards and the ALT Key (Continued)

In addition to producing additional characters with the French, German, and Italian keyboards, you can also produce additional characters with the Spanish and British English keyboards.

Spanish



British English



Additional Keycaps

An international keyboard comes with additional keycaps labeled with the additional characters shown on one of the preceding charts. These keycaps can be placed above the top row of keys for quick reference. Refer to Appendix G for information on how to install these keys.

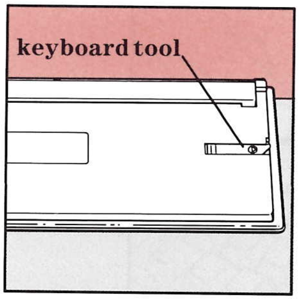
Appendix G: Replacing Keyboard Tiles and Keys

To add new keys to your keyboard, you use the keyboard tool provided with your keyboard to remove a keyboard tile or key, and then you install the new key.

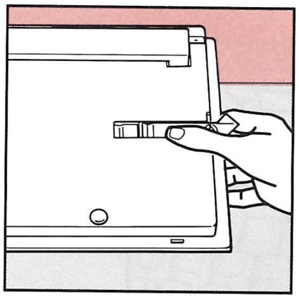
Removing the Keyboard Tool

To remove the keyboard tool from the bottom of the keyboard, follow these steps.

1. Locate the keyboard tool attached to the bottom of the keyboard.



2. Slide the keyboard tool out from the keyboard.

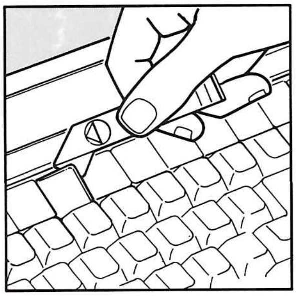


Now that you have the keyboard tool, locate the tile or key you want to remove and use the appropriate procedure below to remove the tile or key.

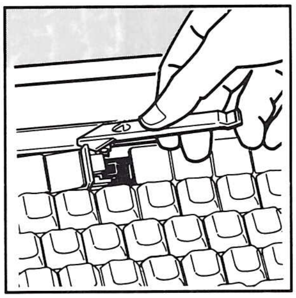
Removing a Keyboard Tile

If you want to remove a keyboard tile, follow these steps.

1. Place the pointed end of the keyboard tool underneath the corner of the keyboard tile.



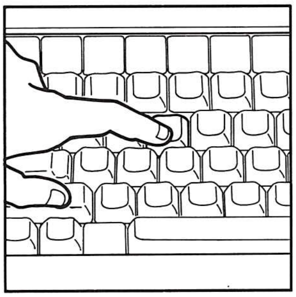
2. Use the keyboard tool as a lever to push the keyboard tile up.



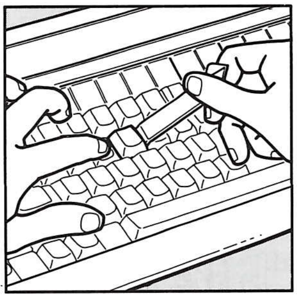
Removing a Key

If you want to remove a key from the keyboard, follow these steps.

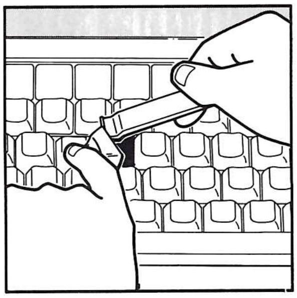
1. Press down the key next to the key you want to remove.



2. Place the square end of the keyboard tool underneath the key.



3. Use the keyboard tool as a lever to push the key up.



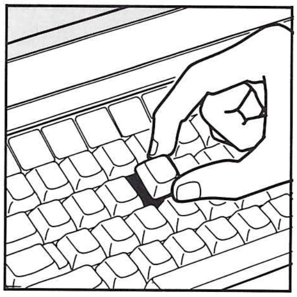
Appendix G: Replacing Keyboard Tiles and Keys (Continued)

After you have removed the appropriate keyboard tile or key, you are ready to install a new key.

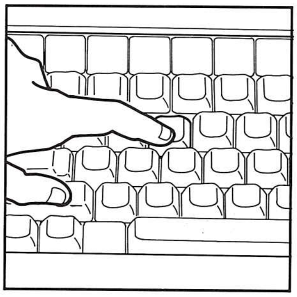
Installing Keys

To install a key on the keyboard, follow these steps.

1. Turn your key so the flat edge of the key is up.



2. Push the keycap down on the keycap connector.



3. Store the keyboard tool on the bottom side of the keyboard.

Appendix H: Operating Requirements

This appendix lists the requirements for operating your system safely, describes the environment your system requires for reliable operation, and gives the specifications for electrical power.

Safety Requirements

To ensure the safe operation of your equipment, you should follow this list of guidelines.

1. Make sure your system is properly grounded to prevent electrical shock hazards to the operator. This is usually accomplished by connecting the equipment to a grounded power outlet with the power cables provided. If other means of connection are used, ensure the equipment is properly grounded and the wiring is adequate.
2. Make sure you have easy access to the **ON/OFF** switch on the system unit so you can turn it **OFF** quickly if necessary.
3. Do not remove the cover from the display unit; hazardous voltages may be present. The display unit should be serviced by qualified personnel only.
4. When you connect or disconnect cables, make sure the **ON/OFF** switch on the system unit is in the **OFF** position.
5. Before you remove the cover from the system unit to install options, ensure the **ON/OFF** switch is in the **OFF** position. Before you disconnect the power cable, disconnect all other cables from the system unit.
6. Do not remove the cover for the internal power supply in the system unit; hazardous voltages may be present. The power supply section should be serviced by qualified personnel only.
7. When you install an option, consult manuals supplied with the option for additional safety information.

Appendix H: Operating Requirements (Continued)

To ensure the continued reliable operation of your system, the proper environment and power supply are essential.

Air Quality	Contaminants in the air can cause your system to operate erratically. The air in the room should be: • Filtered (recirculated air from an air conditioner is ideal). • Free of dust, chemical vapors, and other contaminants.
Static Electricity	Static electricity can damage the electronic circuits in the system. To minimize the buildup of static electricity, you should: • Make sure the relative humidity is around 50 percent. (Use a humidifier in dry climates.) • Use an antistatic spray on the carpet near the system. • Use an antistatic floor mat.
Temperature	Temperature extremes can damage the system. To ensure reliable operation: • Leave several inches of space at the sides of the system unit, at the back of the system unit, and above the display unit to allow for ventilation. • Do not operate the system in temperatures that are above 40°C (104°F) or below 10°C (50°F). • Do not operate the system in an area where temperature changes may occur at more than 10°C (18°F) per hour.

Power Requirements

To ensure reliable operation of your system, always make sure the system is plugged into a properly grounded power outlet.

Your system can have one of two requirements for voltage and frequency.

- 120 volts, which will operate in the range of 90 to 132 volts alternating current (VAC) at 47 to 63 Hz
- 220 volts, which will operate in the range of 180 to 264 VAC at 50 Hz

Most external devices, can work with only one voltage. Read the labels on the back of the display unit and other external devices to determine their power requirements. Use only a power source that meets those requirements.

Power-Line Interference

Changes in voltage and current from a power outlet may affect the performance of your system. Even a small variation in the power can cause vital data to be lost or can cause errors to occur in a program. If you suspect that interference in the power line is a problem, you should try one of these:

- Use a power-line conditioner, such as a line filter or isolator.
- Plug the power cable into a power outlet that is on a different electrical circuit.

Appendix I: Specifications

This appendix provides a quick reference of system features and mechanical and electrical specifications.

Physical Characteristics

Physical dimensions:

- Length — 43 cm (17 in)
- Width — 18.4 cm (7.25 in)
- Height — 47.0 cm (18.5 in)
- Weight — 19 kg (42 lb)

Performance Characteristics

Processor:

- 80286; optional 80287 Numeric Coprocessor

Clock speed:

- 6 MHz

Memory:

- 512 Kb standard; expandable to 3.64 Mb without using an option slot

Operating Environment

Temperature:

- 10°C to 40°C (50°F to 104°F)
- Less than 10°C (18°F) maximum temperature change per hour

Relative humidity:

- 15 % to 80 % without condensation

Altitude:

- -300 m to 3000 m (-984 ft to 9840 ft) unpressurized

Storage Environment	Temperature: -40°C to 65°C (-40°F to 149°F) Relative humidity: 5 % to 95 % without condensation Altitude: -300 m to 12 000 m (-984 ft to 39 370 ft) unpressurized

This glossary explains many of the terms found in this manual, as well as other computer-related terms you may encounter.

access	The ability to obtain data from or place it into internal memory.
adjustment tabs	Tabs on the keyboard that allow you to raise or lower the keyboard foot.
American Standard Code for Information Interchange	See ASCII.
application programs	Programs that instruct the system to perform specific tasks by using either predesigned programs (such as a word processing program) or programming languages that allow you to design your own programs (such as BASIC).
archiving	The process of storing backup copies of data files in a separate location.
ASCII	An acronym for the **A**merican **S**tandard **C**ode for **I**nformation **I**nterchange; an agreed-upon standard for the assignment of numeric values to letters, digits, punctuation marks, and control codes. The system processes only numbers even though characters, letters, and graphic symbols appear on the screen. The ASCII list is a set of numeric values for the most frequently used characters. The system converts these numeric values to their binary equivalents.
asynchronous communication software	This type of software is primarily used when you want to communicate with a subscription information service, send or receive electronic mail, or process using a remote system.
backing up	The duplication of a program or file onto a separate storage medium so that a copy will be preserved against possible loss or damage to the original.

backup	A duplicate copy of information or programs; usually stored on a floppy diskette and kept in a separate location in case the original is lost or damaged.
BASIC	An acronym for **B**eginner's **A**ll-purpose **S**ymbolic **C**ode; a programming language widely used because many of its commands resemble everyday language.
baud rate	A measure of the speed at which transmission is sent from one system to an external device or from one external device to another. In most systems, it is the number of bits of information per second (bps).
binary	A system of numbering that uses patterns of only 0's and 1's. Each item of information (whether a letter, graphic symbol, or an instruction) is converted to a binary number before it is processed by your system.
bit	A binary digit (0 or 1); the smallest unit of information used by your system.
bits per second	The speed at which your system receives or sends information to a device, such as a telephone or serial printer.
boot	To start your system.
BPS	See **b**its **p**er **s**econd.
buffer	A portion of the system's memory that temporarily holds information used by a program. An example is the portion of a document you are working on while using a word processor.
bug	An error in the hardware or software of your system that causes an operation to perform incorrectly.

byte	A grouping of eight binary digits (bits) that your system treats as one unit; usually represents one character.
cable notches	Notches in the keyboard that allow you to put the keyboard cable in three different positions.
central processing unit	The electronic circuits in your system where most processing of information takes place.
character	One of a set of symbols, such as letters, numbers, or punctuation marks, that can express information when collectively arranged. Although these symbols are intelligible to humans, they are not understood by your system. For this reason, standardized character codes consisting of groups of binary digits have been developed to allow characters to be processed by computers. In most computers, a character is represented by 8 bits, or 1 byte.
character set	A list of codes, such as ASCII, that assigns a special standardized group of binary digits to each printed character.
clock	A timing device which coordinates all internal events in your system.
CMOS	An acronym for **C**omplementary **M**etal **O**xide **S**emiconductor; a large-scale integration technology that requires low power consumption and is therefore used for battery-assisted memory systems.
command	The portion of a computer instruction that specifies what operation is to be performed.
communications	The electronic transfer of information between computers or between a terminal and a computer. An example is sending a data file to another computer by using telephone lines.

compiler	A program that translates a language, such as BASIC, into a language your system can understand. A compiler translates the entire program just once.
computer	A combination of a central processing unit and memory designed to process information. Although a combination of the central processing unit and memory is defined as a computer, an input device (such as a keyboard) and an output device (such as a display unit) are required to make the system useful.
configure	To adapt software so that it sends the correct control codes to external devices, such as printers.
control code	A control code either initiates some kind of physical control action that is not printed (such as line feed and tab), turns off an external device, or is used in combination with other characters in order to define unique commands (such as pressing the **CTRL** key and **C** might tell the system to abort a program). A numeric value that instructs the system or an external device to perform a specific action.
controller	Electronic circuitry that allows communication between the system unit and an external device.
coprocessor	An auxiliary processing unit designed to speed up the processing of certain types of information.
CPU	See **central processing unit**.
CRT controller	An option board that sends information from the system unit to a display unit.
cursor	A special square character on the screen that indicates the next position at which a character will be entered or deleted.

data	Information that is input to your system and is then processed by mathematical and logical operations so that, ultimately, it can be output in a sensible form. It usually consists of numbers, letters, or symbols that describe an object, idea, condition, relationship, or other type of information.
data base	A collection of related information; usually a large number of data files stored in one or more storage media.
data files	A group of records with common descriptive attributes. For example, a customer data file might consist of records describing basic customer information. Each record would represent one customer of the company.
data processing	The input, storage, manipulation, and dissemination of information using sequences of mathematical and logical operations.
default value	A value that your system assumes as a response to a prompt, unless instructed otherwise.
device driver	Small programs that are used to control external devices or to run other programs. A device driver directs production, manipulation, and presentation of appropriate signals by the system so that the external device will perform as required.
Diagnostics programs	Programs that test the components of your system to verify proper operation or diagnose problems.
directory	The list of all files, which is itself a file, on your system storage medium for the user's easy reference.

double density	A technique used to increase bit density on a magnetic storage medium to twice the amount of single density so that more information can be stored in the same amount of area.
double-sided diskette	A magnetic medium capable of storing information on both of its surfaces.
drive lever	A mechanical device that opens and closes the floppy drive.
drives	A device that rotates magnetic media and accesses its data by means of a read/write head.
external commands	The utility programs of the operating system allow you to use these commands, which are needed occasionally for operations, such as copying an entire floppy diskette or partitioning a Winchester drive.
external devices	A device, usually for input or output connected to your system to increase its capability and usefulness. Examples include printers and modems.
external modem	A device that allows use of telephone lines for communication between computers.
file	A group of organized data assembled for one particular purpose, considered as one unit, and stored in permanent off-line storage, such as a drive or tape.
filename	A name that distinguishes one file from another; may consist of alphabetic characters, numeric characters, or a combination of both.
floppy controller	A device that controls how information is transferred between the system unit and floppy drives.

floppy diskette	A flexible, flat, circular medium that magnetically records and provides access to stored data. It is divided into concentric circular tracks and wedge-shaped sectors. The floppy diskette is sealed in a protective square cover that is lined with a soft material, which cleans as it rotates. The cover has several openings and notches to accommodate the drive.
floppy drive	A device that rotates floppy diskettes and accesses its data by means of a read/write head.
formatting	Preparation of various types of magnetic media to accept data. For example, before you can use floppy diskettes, track and sector information must be set for the controller. After it is formatted, the floppy diskette can be used for normal input/output and retrieval operations.
graphics	Visual patterns displayed on the screen or produced on a printer; usually formed by patterns of dots.
half-height floppy drives	A design that allows a floppy drive to occupy approximately one-half the physical space required by a traditional floppy drive.
hardware	The physical components of a system: central processing unit, internal memory, drives, printer, display unit, option boards, external devices, etc. Contrast with software.
head	A small electromagnetic device that reads, records, and erases data on a magnetic storage medium, such as a drive or a tape cartridge. Also called a read/write head.
hexadecimal	A numbering system that consists of 16 symbols, 0 to 9 and A to F; used by programmers as a convenient method for expressing binary values.

hub	Reinforces the area of the recording surface that the floppy drive touches to rotate it.
index hole	Helps the floppy drive find information on a floppy diskette.
input	Information that enters the system.
input/output	An operation that transfers information from the central processing unit to a device or from a device to the central processing unit. An example is storing and retrieving information with a floppy diskette.
internal commands	The core program of the operating system allows you to use these key commands. These commands are necessary for day-to-day operations, such as copying files.
internal memory	A temporary storage for information (programs and data) in binary form.
in-use light	Lights when a drive is active.
keyboard foot	A part located on the bottom of the keyboard that controls the angle of the keyboard.
keyboard tile	A tile that covers a place on the keyboard where additional keys can be added.
keyboard tool	This tool allows you to remove keyboard tiles and keys from the keyboard. It is stored on the bottom of the keyboard.
keyclick	A feature of the keyboard where the keys click each time they are pressed. You can adjust the volume of the click through software.
keystroke	A term used for when a key is pressed.
kilo	A prefix usually equivalent to 1 024; used to designate the memory capacity of a computer or the storage capacity of a storage device.

loop	A series of instructions or one instruction in a program that is repeated for a prescribed number of times, followed by a branch instruction that exits the program from the loop.
load	To copy information from a storage device, such as a diskette or a Winchester drive, into internal memory of the system.
main directory	The primary directory of a floppy diskette or a Winchester drive. Sometimes called a root directory.
mega	Prefix meaning one million.
micro processor	A central processing unit assembled on a single silicon chip.
mouse	A cursor positioning device, manipulated by hand, that moves the cursor in the same direction as the movement created when the mouse is rolled on a flat surface.
mouse device driver	Enables an operating system to interpret signals coming from the mouse.
multitasking	The concurrent execution of two or more programs.
multiuser system	A system in which computer and other external devices are shared in any one of several arrangements by several people.

numeric coprocessor	An auxiliary processing unit used to speed up the processing of mathematical calculations.
operating system	A set of programs that controls the operating of the system. Typically, it regulates space allocation, keeps track of files, saves and retrieves files, and manages other control functions associated with data storage.
Optical Mouse	See mouse.
option	A device, either internal or external, that expands the power of your system.
parallel printer	A printer that communicates with a system using the parallel transmission of data.
partitioning	This divides a Winchester drive into a maximum of four work areas, each with a different operating system.
PC-AT mode	A mode of operating that emulates the features of an IBM PC AT.
platters	The Winchester drive stores information on this magnetic media located inside the drive.
plotter	A device for producing a hard copy of graphic images by controlling pens or other drawing media.
port	An input/output connection for interfacing external devices with the system. The port has both male and female connectors that contain a specific number of pins.
processing	This includes the calculating, sorting, storing, and retrieving of information.

program	A list of instructions that tells your system how to perform a specific task.
program file	A program stored on a storage medium, such as a diskette or Winchester drive.
programming languages	A set of words, abbreviations, or symbols that are converted into the binary numbers that represent instructions to the system. Programming languages enable programmers to write instructions using words or symbols and avoid the time-consuming task of entering the long string of 0's and 1's that represent the numeric language of the system. A programmer can use any one of several different programming languages (FORTRAN, BASIC, etc.) designed for his or her system. Some programming languages have more than one version, such as MS-BASIC.
random access memory (RAM)	A type of internal memory that is used for the temporary storage of information. The contents of random-access memory can be altered, allowing information stored there to be processed. Unlike read-only memory, information in RAM is lost when power is turned off. For this reason, information in RAM must be saved on a storage device before the system is turned off.
read	To access information from a storage device.
read-only memory (ROM)	A type of internal memory that contains permanent instructions for your system. The contents of ROM cannot be altered. For this reason, essential instructions are permanently stored in ROM. These instructions, such as those that execute the self-test, are not lost when the system is turned off.

security lock	Restricts access to the system; when locked, prevents the front panel from being removed.
self-test	An automatic check the system performs each time it is turned on.
serial printer	A printer that communicates with a computer using the serial transmission of data.
software	Computer programs, usually supplied on diskette.
storage medium	Material coated with a magnetic substance that is used for the permanent storage of information.
tape backup	A device that stores information on a tape cartridge; primarily used to backup information from a Winchester drive.
TI mode	A mode of operating that emulates the features of a TIPC.
turbo operation	A feature of your system that causes the speed your system processes information to increase by 20 to 30 percent.
Winchester drive	A combination of drive mechanism and permanently sealed storage medium; capable of storing large amounts of information.
working copy	A copy of a diskette that is used in day-to-day operations while the original is kept in storage. This term can also mean a diskette that has both an operating system and an application program on it.
write	To record information on a storage device.
write-protect	A means of preventing information from being written onto a storage medium.

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Texas Instruments BUSINESS-PRO Professional Computer Warranty

This section contains important information about the Texas Instruments BUSINESS-PRO Professional Computer.

Contents of the Section

The following information is available in this section:

- An explanation of the one-year limited warranty
- A list of service facilities

Texas Instruments BUSINESS-PRO Professional Computer One-Year Limited Warranty

Customer service and warranty information is applicable only in the United States and Canada. Please refer to the local customer service and warranty information where applicable. This Texas Instruments BUSINESS-PRO Professional Computer Warranty extends only to the original Purchaser of this product ("Purchaser") who qualifies as a consumer.

Warranty Duration

Texas Instruments Incorporated warrants this Computer for a period of one (1) year from the date of original purchase by the Purchaser.

Warranty Coverage

This Computer is warranted against defective materials or workmanship. Expendable items such as fuses, light bulbs, etc. are not warranted. **This warranty is void if the product has been damaged by accident, unreasonable use, neglect, improper service or other causes not arising out of defects in materials or workmanship.**

Performance by TI Under Warranty

During the one-year warranty period, the Computer will be repaired or replaced with a new or reconditioned product of the same or equivalent model (at TI's option) when the Computer is returned either in person or by prepaid shipment to an authorized Texas Instruments Computer Dealer or TI Service Center with a copy of the purchase receipt. Please first contact the Dealer from whom you purchased the Computer to determine the exchange policy of the Dealer.

Texas Instruments strongly recommends that you insure the Computer for value prior to shipment.

The repaired or replacement Computer will be warranted for one month from date of repair or replacement. Other than the postage requirements (where allowed by state law), no charge will be made for the repair or replacement of an in-warranty Computer.

Warranty and Consequential Damages Disclaimer	**Any implied warranties or conditions arising out of this sale including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose, are limited in duration to the above one-year period.** **In no event shall Texas Instruments be liable to anyone for special, collateral, incidental or consequential damages, whether alleged as a result of breach of contract, breach of warranty, or tortious conduct. These excluded damages include, but are not limited to, cost of removal or reinstallation, outside computer time, labor costs, loss of goodwill, loss of profits, loss of savings, or loss of use or interruption of business.** Some states do not allow the exclusion or limitation of incidental or consequential damages or limitations on how long an implied warranty lasts, so the above limitations or exclusions may not apply to you.
Legal Remedies	This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Texas Instruments Service Facilities

U.S. Residents:

Texas Instruments Incorporated
DSG Service Facility
P.O. Box 1444, MS 7758
Houston, Texas 77251
(800) 572-3300

Canadian Residents:

Geophysical Services Incorporated
41 Shelley Road
Richmond Hill, Ontario
Canada L4C 5G4
(416) 884-9181

Purchasers in California and Oregon may contact the following Texas Instruments offices for additional assistance or information.

California:

Texas Instruments Incorporated
DSG Service Facility
831 South Douglas St., Suite 119
El Segundo, California 90245
(213) 973-2571

Oregon:

Texas Instruments Incorporated
DSG Service Facility
6700 Southwest 105th
Kristin Square, Suite 110
Beaverton, Oregon 97005
(503) 643-6758

Customer Response Form

Response Number
(Assigned by TI)

Your comments and suggestions assist us in improving our products.

About you:

Your computer type: ______________________ Date: __________
Your name: ______________________________
Company name/department: ______________________
Telephone: (______) __________ Address: ______________
City: ______________ State: __________ ZIP: __________

About your system:

Size of memory (RAM): ______________ Type of display: __________
Type of graphics: ______________________________

Check if you have:
☐ One diskette drive ☐ Two diskette drives ☐ Winchester disk

Response concerns:

☐ Hardware TI Part No.: __________
☐ Software Name ______________ Version No.: __________
☐ Manual Serial No. (if any): __________

Did you run diagnostics? ☐ Yes ☐ No
Additional documentation attached? ☐ Yes ☐ No
Error code or message ______________________________

Comments:

If your comments concern a manual, please include applicable page numbers.

Please use one form for each response.
Attach additional sheets if required. Date Received by TI __________

From:

Name ____

Company ____

Address ____

____

____

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Data Systems Group
Attn: PC Sustaining
P.O. Box 2909 M/S 2234
Austin, TX 78769-2909

Customer Response Form

Response Number
(Assigned by TI)

Your comments and suggestions assist us in improving our products.

About you:

Your computer type: ______________________ Date: ____________
Your name: ______________________________________
Company name/department: ______________________________
Telephone: (____) ______________ Address: ____________________
City: ____________________ State: ______________ ZIP: ____________

About your system:

Size of memory (RAM): ________________ Type of display: ____________
Type of graphics: ______________________________________
____

Check if you have:
☐ One diskette drive ☐ Two diskette drives ☐ Winchester disk

Response concerns:

☐ Hardware
☐ Software Name ____________________
☐ Manual

TI Part No.: ____________
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